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INDUSTRIAL USES OF FUEL OIL.
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REPORT OF OREGON ELECTRICAL CONTRACTORS' MEETING.

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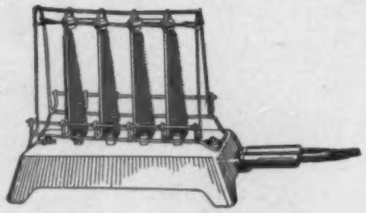
it's to be more of an electrical season than ever before



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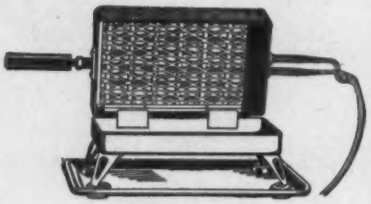

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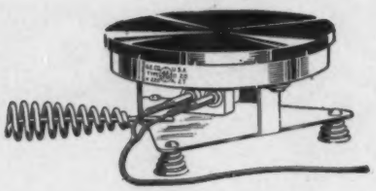

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POWER AND GAS
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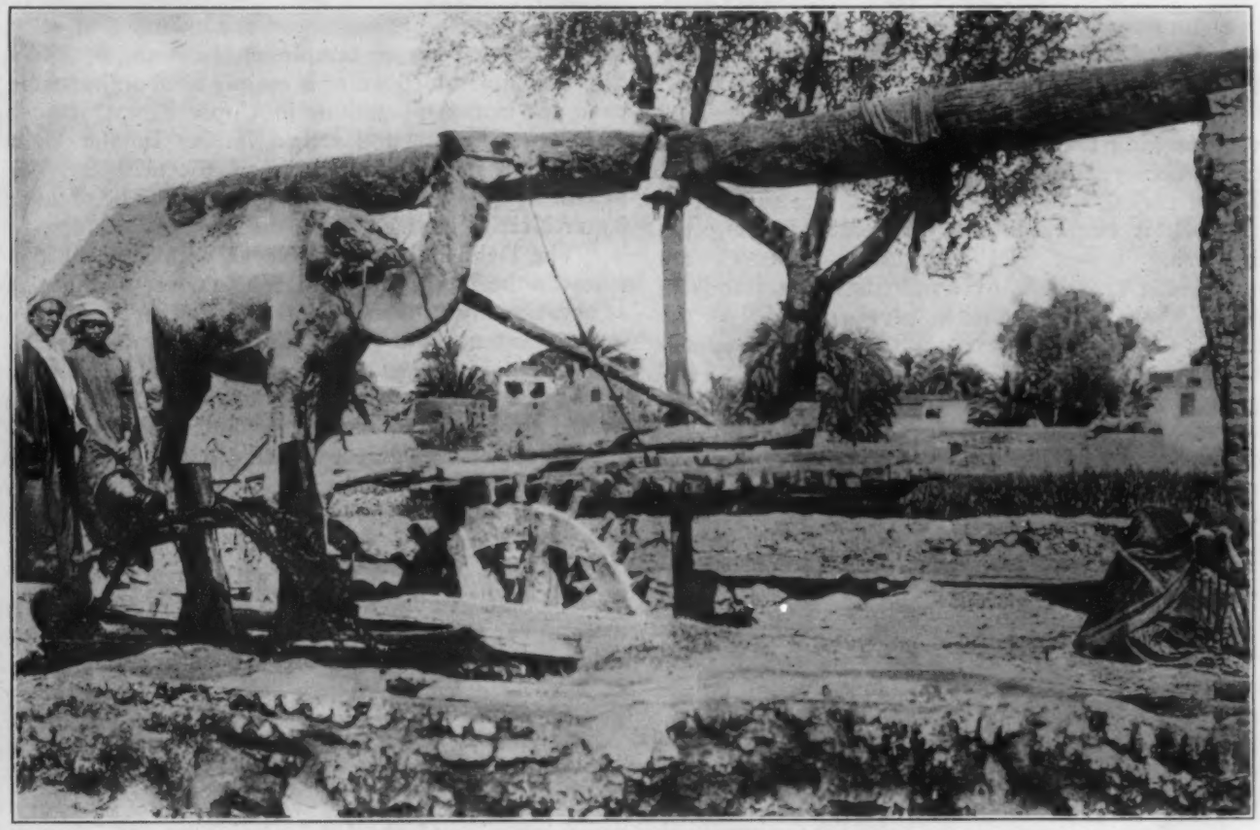
EGYPT AND CALIFORNIA

BY A. E. CHODZKO.

(This article describes conditions in Egypt which are similar to those found in several places on the Pacific Coast. A peculiar interest attaches to them because of the entertaining way in which they are described by the author and because of the increasing use of rice culture in improving alkaline lands. The cuthor is a consulting engineer at San Francisco.—The Editor.)

California has so liberally been endowed with the natural elements of wealth that many of its citizens unconsciously overlook the fact that large portions of that privileged land are still open to substantial improvement, before they can be entered among the prosperity assets offered to the intended investor. One result of this not unnatural tendency is that little, if anything, is known by the general public of systematic attempts by the Federal Government to add new staples to the list of merchantable produces of California, until its attention is occasionally called to the existence of an already full grown, yet so far unsuspected industry.

These remarks have particular reference to the cultivation of rice in California, particularly in Butte, Glenn and Yuba counties, where 16,000 acres have already been devoted to this purpose within the past four years, and as much more now is in immediate contemplation.



Egyptian Sakieh for Irrigating Rice Fields.

Rice plantations are all but a novelty in the United States; their recent development on the Pacific Coast is, however, of special interest, owing to

the similarity of physical conditions between some of its inland valleys and the Egyptian Delta, where the writer happened to be, for several years, connected with that same kind of culture on an extensive scale; it is assumed that a few reminiscent remarks on the subject might be of passing interest. They are, of necessity, limited to the technical side of the subject; the difference of times, of customs, and of working methods would deprive commercial considerations of any useful feature.

Egypt has, from time immemorial, and still is, an essentially agricultural country, of proverbial fertility. This is due to the perennial accretion of virgin ground, furnished by the large proportion of organic sediment carried at all times in suspension by the waters of the Nile. That huge stream, the only source of supply in the land, reaches Cairo after a course of some 4000 miles from Lake Victoria Nyanza, and at a short distance below that city it forks into two branches, emptying into the Mediterranean, one to the west, at Rosetta, the other to the east, at Damietta.

The cultivated portion of the valley of the Nile is only a few miles in width, except at the base of the triangular expanse extending between and on either side of the two branches, and known as the Nile's Delta. Both above and below Cairo the abrupt transition from the green crops of the cultivated land to the arid sand dunes of the desert is a striking feature typical of those localities.

The Nile is subject to periodical rises, the high water reaching the Delta from three to four months after its occurrence in the great central African lakes, and that period, which happens in the late summer or early fall, is one of intense excitement among the neighboring towns and villages; the levees are guarded day and night by hundreds of thousands of natives, along both branches of the river. At the peak of the flood the level of the swirling, muddy waters reaches close to the crest of the banks, and high up above the surrounding lands; full well do these men know that with levees made out of alluvial sediment a slight leak through a gopher hole or through a tiny crack very soon increases into an uncontrollable torrent, and has sometimes been followed by the submersion of entire provinces.

That mighty current, rolling seaward a volume of 495,000 second feet, presents, indeed, an interesting sight, as also does the alacrity of the crowd of watchers, ever ready to pile up at some threatened point great sacks of chaff, stacked to that effect along the levees.

The main streams of the Nile are tapped by a great number of large and small laterals, which distribute their waters over the plains; some of them are of considerable size, as, for instance, the Mahmoudieh Canal, that shoots from the left bank of the Rosetta branch, to supply drinking water to Alexandria, some 45 miles distant. Less trouble exists, therefore, in providing abundant irrigation during the flood period than in safely controlling its volume; but during the low water season artificial means often have to be adopted to insure an adequate supply.

Such a great disparity of flow could not fail from arousing attention, in a land replete with indications of a high development of civilization at the remotest epochs in human history; there is no question but that attempts were made on a large scale to store up part of the flood waters for the dry season.

Lake Moeris, a sheet of water 34 miles long by 4 miles wide, in the province of Fayoum, some 60 miles above Cairo, is believed to have been part of such a project, as well as remnants of canals, more or less filled up by the sands of the surrounding desert, and supposedly contemporaneous with the biblical days of Joseph and of the Pharaohs. The magnitude of these vestiges bears testimony to a remarkable state of technical advancement.

A dam of modern construction has for many years existed across the Nile, a short distance below Cairo; its impounding qualities were, however, greatly impaired by its leaky condition, when, in 1898, construction work was begun on a large dam at Assouan, Upper Egypt, 700 miles above the mouth of the river. That work was completed in 1902, and secured a storage capacity of 863,000 acre feet, covering an area of 40,000 acres. At the same time a diverting dam was constructed across the Nile at Assiout, 339 miles below the former. It has since been decided to raise the Assouan dam to a sufficient height to double its storage, a decision, by the way, distasteful to the archaeologists, as it will mean the submersion of the ruins of a well-known temple on the island of Philoe.

The impounded water is mainly used on important cane and cotton planations in Upper Egypt, most of them government and crown lands. In the Delta, and during the low water season, the necessary supply for irrigation has, in many localities, to be obtained by artificial means.

The Delta is practically level, with a slight slant towards the Mediterranean. The surface of the plain is occasionally broken by low hillocks, or "koms," of limited extent; those mounds are accumulations of debris and of broken bricks, the remnants of ancient towns and villages gradually annihilated by the repeated action of sun, wind and inundations. The flood waters, collecting against the sand dunes of the beach, naturally had to find an exit more effective than evaporation, and thus were formed shallow lagoons of large area with a seaward outlet through the sandy shore.

Such are Lake Mariout, with an area of 50,000 acres and an average depth of 3 feet; Lake Bourlos, of approximately similar size, and the larger Lake Menzaleh, terminating near Port Said, the northern end of the Suez Canal. These lakes, extending inland into a ramification of sloughs, serve as natural drainage collectors for the adjacent territories. Under ordinary circumstances, lands could therefore be irrigated by gravity between the bank of the Nile, or of some lateral, and the level of the nearest lake, and even during the low water season, this never falls much below the irrigation canals, say 10 to 14 feet; and therefore, the problem of artificial water supply generally defines itself by a variable capacity and a low pumping head.

This requirement is often met by the shadouf or the sakieh, two specimens of native engineering little different today from what they were many centuries ago. The shadouf is made of a bucket of any material,

wood, clay, woven straw (and in modern designs, 5-gallon coal oil cans) suspended to one end of a pole and counter-balanced by a lump of mud. It is operated by hand, see-saw fashion; these scoops are often used in series.

The sakieh belongs to the "noria" type of pump; it consists of an endless rope, with earthen pots attached 2 or 3 ft. apart, passing over a spider connected to a horizontal shaft, itself operated through bevel gearing by a vertical post, to which is hitched a camel or water buffalo. The shafts are rough pieces of logs stripped of their longer limbs, resting on portions of forked trunks in lieu of bearings; the gears are made of an indefinite number of wooden plugs, of arbitrary shape, set along a wavy, circular

Landing Place at Luxor, on the Nile.

curve. The use of sawed lumber and of a square is conspicuously avoided, and the mention of that ancient contraption will doubtles evoke a familiar sight in the memory of the former tourist or traveler. A variegated gamut of creaking sounds invariably accompanies its operation, and acts as a record of the activities of the team, drowsily pacing its circular track, in the midst of a cloud of flies, during the hot, sunny days. Eventually the soporific effect of that lullaby is proving too much for the power department, and the melody dies out by degrees, until the engineer in charge, slumbering on the double-tree and roused from his dreams by an ominous silence, starts up the motors with a wealth of expletives, for which the Arabian race has long since won a deserved fame.

These, however, are relics of the past, and many modern plants are found both along the river and the canals; a centrifugal pump operated by a portable steam engine constitutes a general type of outfit, while in some cases the installation assumes a character of permanency. Such, for instance, is the case, already mentioned of the Mahmoudieh Canal, which carries drinking water to Alexandria, and at the same time is used as the main artery of supply for the irrigation of that portion of the province of Behera, extending west of the Rosetta branch, between that stream, the sea and the Libyan Desert.

The pumping plant is at Khatatbeh, where the canal joins the river, and a first installation consisted of a battery of inclined Archimedean screws, laid side by side, and actuated through bevel gearing at the top by a common countershaft running alongside. These screws had a barrel of steel plate about 10 ft. in diameter by 40 ft. in length, with inside riveted helical spires; they gave considerable trouble, owing first to the difficulty of protecting the foot step from the grit in muddy water, and second, to the shearing of the rivets under the inertia strains created by such a large moving mass of water.

That plant was removed and superseded by centrifugal pumps from the firm of Farcot & Co., St Ouer, near Paris. Their dimensions and their capacity warrant a short description. The station comprises five of these pumps, each with a vertical shaft driven by a separate single cylinder steam engine of the Corliss type (39.37) in. in diameter, with a stroke of 5 ft. 10.8 ins. The lift is 10 ft., and the capacity is 95,400 gal. at 32 r.p.m. in normal work, the speed being variable between 16 and 42 r.p.m. The runner measured at tips of vanes is 12 ft. 5 in., and the casing is 19 ft. 8 in. in diameter, and nearly 12 ft. high, resting on six cast iron columns.

The single inlet has a diameter of 6 ft. at the throat increasing to 9 ft. 10 in. at entrance. The discharge flow controlled by a sluice gate has a velocity of less than 2 ft. The useful work of the pump is 65 per cent of the indicated horsepower.

Another type of modern pumping plant will be described further on; the influence of that subject on the reclamation of arid lands is closely connected with the economical generation of motive power; in Lower Egypt labor is cheap but power is expensive. Victoria Falls, on the Zambesi River, are very far off; the nearest source of hydraulic power, the cataracts of the Nile, are more than 1000 miles away, and they remain to be harnessed for that purpose.

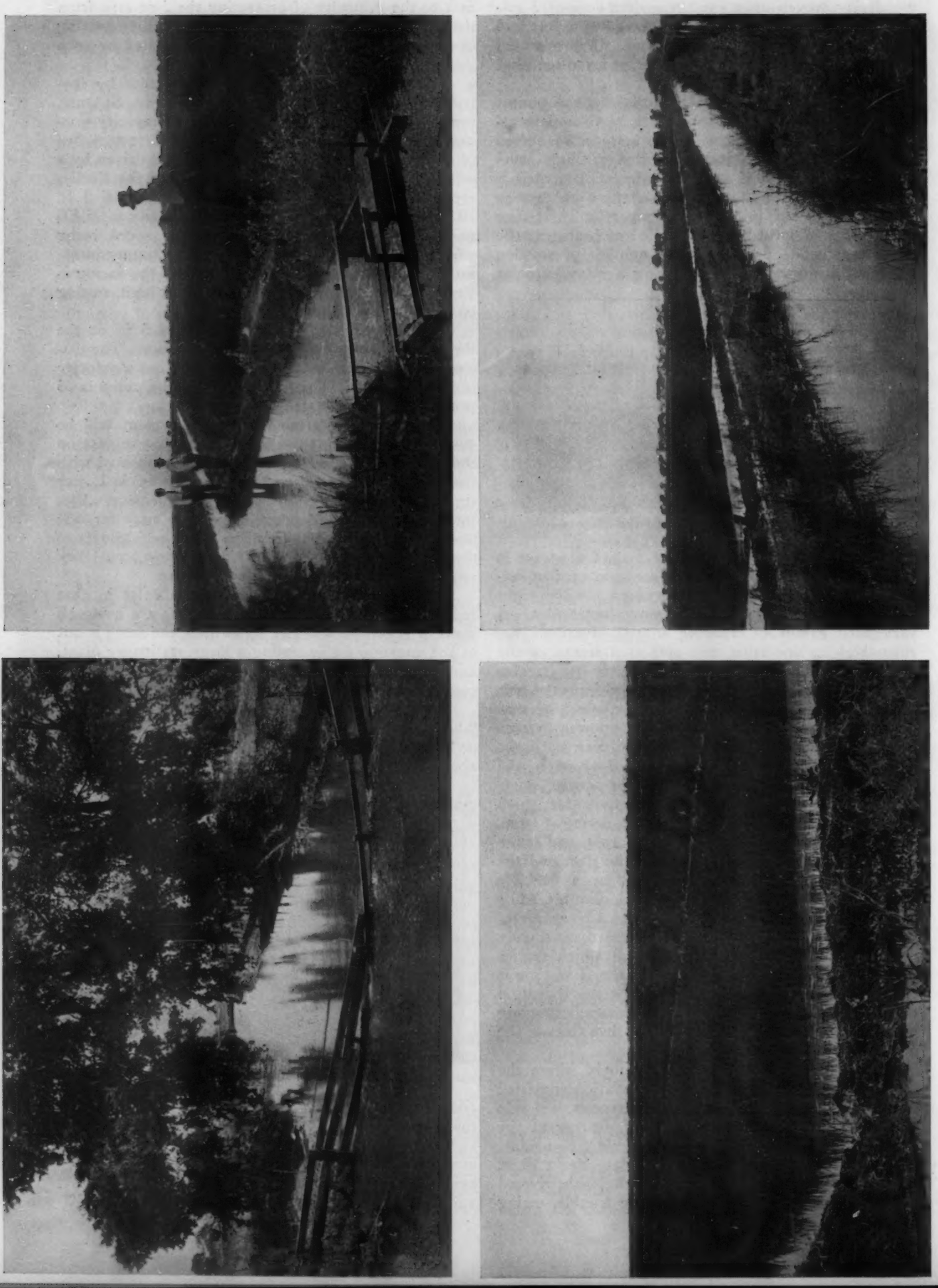
Neither coal, nor oil, nor forests exist in that region, and while small pumping outfits are using all sorts of vegetable trash as steam fuel, the same is out of the question for operating a large stationary plant, and imported coal is the only available and very costly recourse.

In California the conditions are reversed, since labor is expensive, while motive power, in one form or another, is, in many cases, available on an acceptable basis.

The regular crops in the Egyptian Delta are mainly cotton, rice and also, on a smaller scale, corn

Typical View of the Modern Nile.

(doura) and clover (bersim); on lands that have been under regular cultivation the logical course to follow is, of course, associated with a proper rotation of crops, the exhausting influence of any particular one being, as already remarked counteracted by the renovation due to the sediment in the irrigation water.



Views in Rice Fields of California.

(Courtesy of Pacific Gas & Electric Co.)

But when new ground is to be prepared for the staple cotton crop, it frequently happens that it is found prohibitively saturated with alkaline salts, and the soil must first be scrubbed, or washed, before the cotton seed may safely be planted to it. In such cases—and they occur on vast areas—rice, while never being considered a negligible quantity, becomes, in the present instance, a sort of by-product, the primary object of its cultivation being to cleanse the alkali-permeated soil, and to make it fit for the cotton crop; but that same principle is true of any other crop that could not be raised in the alkaline soil, and therein lies the connecting link between the American West and Lower Egypt, because a similar problem would frequently be met in the reclamation of arid lands in this country; such was the particular point in view when presenting an apparently irrelevant narrative of methods in use far abroad. The philosophy of the process is to turn the expense of making a barren soil fit for cultivation, to profitable account, by deriving from that preparation a merchantable produce.

Water Buffalos, the Ancient Egyptian Motor.

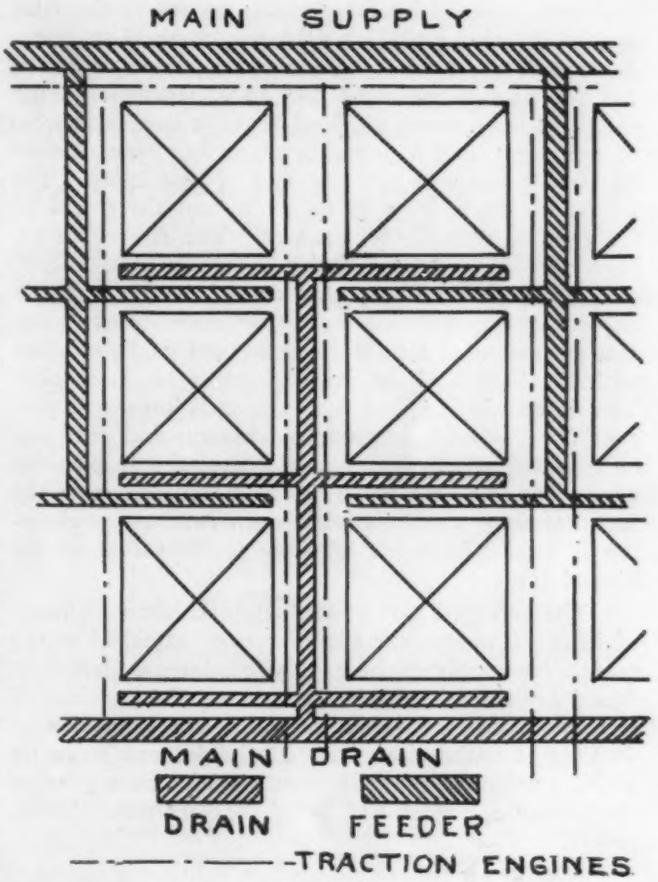
Now, this scrubbing operation implies the influence of percolation, of capillarity, and inductively, of the rate of irrigation. An indiscriminate use of water may be detrimental to the productivity of certain soils, albeit well adapted to other portions of the land, even in the same vicinity. The proper rate should be determined by experiment, in any given soil, which is, perhaps, asking a great deal of the average farmer, who has many irons in the fire and scant leisure for experimental work.

On the Egyptian plantations, under European management, the solution was sought in what might be termed intensive drainage.

Given an unlimited quantity of water in an irrigation canal, its rate of percolation through a given level field varies with the vertical distance from its surface to that of the drainage. The term "level" field is used advisedly in the case of rice; it is, of course, supposed that a homogeneous seed is put on a field of homogeneous composition, and that a crop of uniform growth will be the result. The immersion of the stalks must therefore be the same all over the field. In the washing process the water must remain on the ground long enough to dissolve part of the objectionable salts, yet not long enough to become saturated, and the horizontal flow will be regulated to that effect; this will take care of the salt that has accumulated at the surface of the soil, and also that has been creeping up by capillarity, but part of the water must sink under the surface and wash the soil by percolation, and this action is regulated by bringing the water line in the drainage to a point that must vary in different fields, as also in the same field at different times, and consequently that must be controllable.

To that effect a drainage collector of sufficient depth is equipped with a pumping outfit, discharging into the lake; in other words, as artificial means are used for the supply of the irrigation canal, so are they provided to control the water level in the drainage collector.

This, of course, introduces an additional element of expense, but it also minimizes the water supply, and permits of use at the most favorable moment; at the same time every available labor-saving device was resorted to—ditch-grading, field-leveling, ploughing were done by machinery. The accompanying sketch imparts an idea of the disposition of the fields,



Plan for Draining Ground

divided up into squares of about 500 ft. side. A crew of two traction engines, moving on the roads at opposite ends of a field, and pulling the scrapers or the gang plough back and forth, would do, in the same time, far more satisfactory work than 120 yokes of oxen.

Moreover, the uses to which a traction engine of moderate size, and in the hands of a good man, can be put to good advantage are, indeed, quite a few.

Views in Rice Fields of California.

(Courtesy of Pacific Gas & Electric Co.)

It wil, as stated, operate graders, ploughs and harrows; it will haul heavy loads along bad roads, and unload them on the cars at the railroad station; with a couple of guides attached to the same crane jib, it will act as a pile driver, or else, operate a pump, a circular saw, a fodder chopper, or a dynamo.

Some classes of work, like weeding, or cotton-picking, must be done by hand; but with the modern use of fuel oil and of electricity, there is little doubt but that cultures of that class on a large scale could be carried out with economy and profit.

A modern pumping plant is being put in at Mex, three miles west of Alexandria. The district west of the Rosetta branch, and which includes the province of Behera, is discharging its drainage water into Lake Mariout, which is open to the sea.

The extension of the cultivated portions to an area of some 2400 square miles has had the result of raising the water level in the lake and of impairing its draining capacity on a portion of the land. The Egyptian Government, therefore, decided to reclaim the lands covered by the shallow waters of the lake, and to dig into its bed a drainage canal of sufficient depth to accommodate not only the present cultures, but the prospective ones due to reclamation. That canal, with a bottom width of 92 ft., is now in process of execution, and a pumping plant has been devised for the drainage of the lake and of that canal. The height of lift is from 19 to 20 ft., and there will be ten pumps, two of them spares. The aggregate capacity of the eight remaining pumps will be 550,000 gal. per minute. The pumps are of the Humphrey's explosive type, and operate by the alternate explosion and expansion of a mixture of air and gas, combined with the inertia of the mass of water set in motion. The description of that device is well known to persons familiar with pumping machinery, and need not be repeated at this place. An idea of the proportions adopted in the case at hand will be gained from the fact that the internal diameter of the combustion chamber is 8 ft. 8 in., with 100 inlet water valves of the hinged type.

The enlarged part of the playpipe has a diameter of 12 ft. Compressors are, of course, attached to the pumps for supplyng the explosive mixture, formed of Mond gas and air, the former generated in a plant of the self-vaporizing type, and of a daily capacity of 44 tons of anthracite. The gas holder can store up 10,000 cu. ft.; the plant is contracted for on a guaranteed consumption of 1.15 lb. of coal per water horsepower.

A plant for electric power and lighting is operated by two gas engines of 180 b.h.p. each, direct coupled to 120 h.p. generators, the current being supplied at 225 volts. This plant will be used for the erection of the pumps and for working the centrifugal drainage pumps during excavation. It will be supplied with a temporary suction gas producer plant of 220 h.p. The handling of large volumes of water by direct contact of gases under pressure is a logical step suggested by the enormous size of pumps of same capacity. Air lifts at low pressure would likewise furnish a satisfactory solution of the problem.

LETTER TO THE EDITOR.

What Are We Going to Do About It?

On July 30, 1914, the California Railroad Commission approved the Report by the Joint Committee on Inductive Interference. Following the publicity of this report, we had considerable "fire works" among the "brain shop foremen." Then all is quiet!

As a common ordinary lineman working at the business every day, I would like to say that the Joint Committee is entitled to a great amount of credit for the advanced position they have taken, knowing the subsequent storm would burst about them. And I hope that some day the critics who have so unjustly tried to hold the committee up to ridicule will awaken to the fact that they, "The quidnunc" spoke out of turn. But did the committee go far enough? We say, "No! a hundred times No!"

Let us not deprecate the scientific side of the question. But can we arrive over that route alone? What relief will it give the lineman, the local telephone companies with their patrons and the public at large from the physical hazard?

We will all admit that the physical hazard does exist and should be considered above the scientific side. Chapter 499 of the statutes of 1911 or General Order No. 26 of the California Railroad Commission do not give any relief and General Order No. 39 only such as automatically happens. Absolutely none to the local telephone companies, only indirectly.

Let us not commit the "sin of omission" any longer, let us get something done. Now let us look the proposition square in the face, see where the responsibility rests, and furthermore, put it where it belongs without fear or favor.

My plan is, let the Railroad Commission appoint a committee of linemen (who are actually working at the business, because they entertain the greater portion of the hazard and have a moral right to frame the conditions under which they must labor) to augment the Joint Committee. Let them draft a set of specifications covering all branches of outside electrical construction.

Let these regulations be made retroactive, giving a short reasonable time for reconstruction. Society will gain a much greater security and for that added security let the Railroad Commission allow a sufficient increase of rates that will cover the cost of reconstruction.

This plan looks simple to my lineman mind, and the only true ground on which the problem can be solved.

We have all made mistakes and as long as we advance along constructive lines we will continue to make some errors.

Section 42 of the Public Utilities Act specifically states that it is the duty of the Railroad Commission to safeguard the public and the employe. Is it doing its duty? Look back for a couple of years and see the number of linemen who have been killed and answer the question for yourselves.

How many of us have the spine to put the situation where it belongs? Up to the Railroad Commission! "Am I right?"

O. SANDERS.
212 W. Third St., Los Angeles, Cal.

ELECTRICAL OPERATORS.

BY O. C. BANGSBERG.

(Here is a straight-from-the-shoulder ginger talk on efficient power plant operation. Mr. Bangsberg is chief operator at the Borel station of the Pacific Power & Light Company.—The Editor.)

So much has been written on every subject pertaining to power developments and their operation that the writer thought an article dealing with the operator himself, his qualifications, problem, etc., would be appropriate.

"Men may come and men may go, but I go on forever," seems to apply particularly to the operator's place in a power project. After the site for a development has been located come the engineers for the preliminary survey and estimate, then the interesting of financiers, and finally the complete surveys and final location of the works, followed by construction. Each class of men come, perform their part of the work, and go, leaving the sum total for the operator to assume responsibility for and to operate successfully.

While the operator has had no part in the work until its completion, to be successful he must have a knowledge of all classes of work that is incorporated in the finished product. He must be somewhat of an engineer or he will not know whether he is operating efficiently. He must understand about finances, as applied to a power development, so that he can realize the magnitude of the investment that he must protect, and he must be well grounded in construction work, else how can he hope to operate intelligently the finished product?

"As a man thinketh, so is he," applies equally well to operators, and in the writer's experience, as operator in charge of various plants, it has been hard to reconcile the mental attitude of some of the so-called operators that have passed in review before him. Other qualifications being equal, a man's mental attitude toward his chosen work makes or breaks him, and if his chosen work should be electrical power plant operating, it makes him a real operator or a near operator.

The near operator usually has the training and ability, technically, to make him an operator, but is content to leave things as he finds them and takes the "what's-the-use" mental attitude, contending that as long as he keeps the plant running he will get just as much credit as though he lost some sleep trying to improve the efficiency of operation. Among this class you will find the ones who are always pestering their employers for more wages, failing to realize that if they would only get in and dig increase in wages would come as a matter of course; in fact, the employer couldn't help but raise the man's salary. The writer would not give up the pleasure and satisfaction derived from an unsolicited increase in salary just for the sake of getting the raise a month or so earlier by asking for it. I do not believe that it is ever necessary to solicit an increase in salary, as if a man is saving an employer money and "delivering the goods," so to speak, and the employer does not reward the man properly, there are always other employers who would be only too glad to get the services of such an operator.

But to get back to our subject. You will find that the near operator occasionally will show spurts of action, but somehow they lack the persistence, which is the key to succecss. Herbert Kaufman has well said: "Persistence is the key to existence. Success invariably rewards the good fight. Knowing what to do or how to do it won't bring results. Action must drive ability. The nail is useless without the hammer. Courage is the complement of knowledge."

The real operators are the men who, by self-denial, hard work and loyalty, have won the confidence and respect of their employers to the extent that you will usually find them in charge of the various plants.

The operator in charge of a large power plant, especially those located away from the direct supervision of the office, in addition to being qualified in an engineering way, must be versatile, tactful, courageous, somewhat of a physiognomist, and, above all, square with his employers and the men under him. Versatile, because he often has to be a farmer, accountant, landscape gardener, sanitary engineer, and what not.

Tactful in his dealings with the public, and in presiding, so to speak, over the power plant camp, if he happens to be located in the mountains.

Courageous, because it takes courage to keep out of the "let-well-enough-alone" rut and make changes from time to time that it would be far easier to let slide, but when made would make for better efficiency.

A physiognomist, to be able to read men's characteristics, thereby determining their value as employees.

And square with his superiors and those under him because, if for no better reason, it does not pay to be otherwise.

A real operator's job is a man's job, while a near operator is a joke, and, after all,

The man who wins is an average man,
Not built on any peculiar plan—
Nor blessed with any peculiar luck;
Just steady and earnest and full of pluck.

When asked a question, he does not guess;
He knows and answers "No" or "Yes";
When set a task the rest can't do,
He buckles down 'til he's put it through.

Three things he's learned—That the one who tries
Finds favor in his employer's eyes;
That it pays to know more than one thing well;
That it does not pay all he knows to tell.

So he works and waits, till, one fine day,
There's a better job with bigger pay;
And the men who shirked whene'er they could
Are bossed by the man whose work made good.

For the man who wins is the man who works,
Who neither labor nor trou ble shirks;
Who uses his hands, his head, his eyes—
The man who wins is the man who tries.

In closing I wish to sound a note of warning to the men who are now in charge of the various plants. There is an efficiency wave sweeping over the country into which a number of wideawake men have plunged, clinging to the term efficiency engineer. It has already swept over the large shops of the country, the

large steam electric power plants, and its now even sweeping over the affairs of a large municipality.

While the life buoy, "efficiency engineer," has borne many wideawake men on the crest to large positions, still a far greater number of shop superintendents and engineers have been washed over, and when the wave has passed on, most of the old-established landmarks, of their jobs, have disappeared and new landmarks established, reducing the size of their jobs.

From the distance I seem to see the wave advancing towards the hydroelectric plants, and woe to the man who does not prepare a satisfactory life buoy, in the shape of an efficiently operated plant, that he may carry with him the present size of his job, and wise, I say, is the man who has built his life buoy so strong that he is able, not only to keep safe the present size of his job, but is able to rescue and keep safe bits of other jobs that has been let go by others less fortunate in forethought, thus increasing the size of his job.

A CURE FOR BOILER TROUBLES.

A paper on methods of preventing boiler scale and corrosion was presented at a meeting of the American Society of Mechanical Engineers at San Francisco on December 8, 1914, by Mr. A. H. Babcock, consulting electrical engineer for the Southern Pacific. Company. This paper will be published in full in an early Journal of the Society, but its salient features are of immediate interest.

After telling of the troubles with tube replacement in the Fruitvale power plant of the Southern Pacific Company and of the fruitless efforts to overcome them, Mr. Babcock told how Mr. A. M. Hunt of San Francisco had called his attention to a report by Lieutenant Commander Frank Lyon, U. S. N., in the Journal of the American Society of Naval Engineers for August, 1912. The difficulties which had been solved by the navy were so similar to his own troubles and the method of solution so simple, that Mr. Babcock immediately applied them, and since March, 1914, boiler corrosion has been practically eliminated in the Fruitvale power station, as well as in the company's pumping plants in the California oil fields and the locomotives over the Tehachapi Pass.

The secret lies not so much in the compound used as in the method of using it. The compound is purchased in accordance with the United States Navy Specification 13C3a and consists of

anhydrous sodium carbonate.	76%	(Na_2CO_3)
tri-sodium phosphate	10%	($Na_3PO_4 12H_2O$)
starch	1%	
tannic acid	2%	
water and impurities	10%	

This compound is dissolved in hot water and added to the boiler feed water in such quantity as to always maintain a concentration of 3 per cent normal alkaline strength. This necessitates individual treatment and a close study of each boiler, as pitting will result if this standard is not maintained.

Mr. Babcock's paper was essentially a corroboration of Mr. Lyon's conclusions. The first hint of a means of remedying the trouble came from the insistence of a nurse that several spoonfuls of soda be put in water in order to prevent corrosion or tarnishing of the doctor's instruments.

A series of tests was conducted for three years at the Naval Engineering Experiment Station in studying the trouble. As a result of this investigation, Mr. Lyon came to the conclusion that **"any boiler using any water can be kept from corroding any length of time if treated with soda, and if its concentration is maintained at or above 3 per cent normal alkaline strength."**

"There can be no rule-of-thumb methods of pounds of soda per i.h.p. per pound of coal burned or per gallon of feed water. The water in the boiler must be kept at, or above, a certain concentration of alkalinity, and that can only be determined from the water that is in the boiler. Each boiler must be considered as a separate unit.

"With pure feed water, sodium carbonate and disodium phosphates properly proportioned, will stop corrosion and priming if enough of the mixture is used. If impure water is used, then sodium carbonate, disodium phosphate and cutch (containing tannic acid) will, when used in right amounts, stop corrosion, prevent priming, and also prevent scale from forming, unless the saturation of sludge gets too high. Such a mixture is the Navy Standard Boiler Compound, and if the water in the boiler is, by the use of this compound, always kept at a concentration of or above 3 per cent normal alkaline strength, no corrosion will take place, no scale will form and the water will be no more likely to prime than it would be if it were untreated.

"This is a powdered compound, composed of calcined sodium carbonate, trisodium phosphate, dextrine or starch, and a tannin compound, as mangrove bark, cutch or catechu. These ingredients are intimately mixed by thorough digestion, dried, finely powdered, well mixed, and readily soluble in water."

In practice, 50 c.c. of a sample of boiler water is neutralized by a measured quantity of one-tenth normal sulphuric acid, methyl orange and phenolphthalein being used as an indicator. The amount of acid used shows the per cent alkalinity of the boiler water.

For example, if 4 c.c. of tenth normal acid solution is necessary to neutralize the alkali contained in 50 c.c. of boiler water, the percentage of the normal alkaline strength of the sample is

$$\frac{4}{50} \times \frac{1}{10} = \frac{4}{500} \text{ or } .008;$$

the sample being eight-tenths of 1 per cent of normal alkaline strength.

To be safely non-corrosive the boiler water must be at least 3 per cent of normal alkaline strength. Hence (in accordance with the general formula

$$\frac{A}{S} \times P = X,$$

when A is the number of c.c. of acid required to exactly neutralize the alkali in the sample, S the number of c.c. of the original sample, and P the percentage of normal strength of the acid used), if less than 15 c.c. of tenth normal acid is required to neutralize the 50 c.c. sample of boiler water the latter is not safely non-

corrosive, and additional compound is required in the boiler.

A standard outfit of burettes, graduates, pipettes and solutions is furnished by the navy for the use of its engineers. A similar outfit is used by the Southern Pacific Company, though any chemist can supply the necessary apparatus and directions for testing the water.

The main feature to be remembered is that the water should be tested every day and sufficient compound should be added to make up any deficiency in alkalinity. If it were not for the fact that some soda may be taken over with the steam if the boiler primes or that it is removed when the boiler is blown out or leaks, it would not be necessary to add more compound if pure feed water is used and the water level is kept constant. Some soda may be lost by combination with some of the impurities which come in with the feed water.

At the Fruitvale plant it is usually necessary to add from 4 to 20 lbs. of compound to each boiler during a watch. During 1912 there were 690 tubes replaced, during 1913 there were 858, and during January and February, 1914, tubes were being replaced at the rate of 1400 a year. The new method was first used in March, 1914, when 26 tubes were removed, in April 15, in May 2 and since then none. The treatment costs less than $100 a month, as compared to former costs of over $10,000 a year.

Besides preventing pitting, due to the presence of sodium carbonates, this compound also prevents the formation of scale, as the solid particles are kept in suspension until such time as the boiler may be blown out. This is due to the fact that the tannic acid prevents the crystallization, as all salts are precipitated in colloidal form. Priming is minimized by the trisodium phosphate. Frequent washing out is course necessary to remove solid matter. When the compound is first used it brings out the rust and may thus start leaks.

In the case of the Southern Pacific Company's locomotives over the Tehachapi Pass, the compound is generally added in the proportion of 3 lb. of compound per thousand gallons of feed water. A concentrated solution is introduced through the injector. The boilers are washed every second trip to remove the solid matter in the form of a soft brown mud. In the oil fields it is not possible to maintain a concentration of 3 per cent because of priming, although the corrosion has been stopped with boiler water averaging .5 per cent alkalinity.

Electrolytic iron is produced by the use of a revolving cathode in a neutral solution of iron salts. The solution is kept neutral by constant circulation about the anode. The cathode is depolarized by adding oxide of iron so as to remove the hydrogen, this permitting the use of a current of as high density as 1000 amp. per square meter. The iron salts are made from pig iron. The exceptional purity of the iron thus produced makes it of particular value for electrical machinery. Le Fer Company of Grenoble makes four tons of iron per kilowatt-year with a density of 500 amp. per square meter.

PANAMA CANAL POWER SUPPLY.

In any extended electric power project, there are always four distinct yet interrelated divisions, namely: (1) generating stations; (2) transmission lines; (3) substations; and (4) distributing network.

In connection with the Panama Canal, the main generating station is a hydraulic plant of 6000 kw. capacity, recently completed and now carrying load. The hydroelectric station is adjacent to the Gatun spillway, and receives its energy from water taken from Gatun Lake and discharged into the lower spillway channel. The electrical energy is 3-phase, generated at 25 cycles and 2200 volts (delta).

The hydroelectric station lies three-fourths of a mile west of Gatun Locks, in about the center of Gatun Dam. The permanent towns, plants, operating points, and administrative headquarters are all on the east side of the canal, which is the logical location of the transmission line. It is quite undesirable to cross the canal with a high voltage overhead transmission line; hence, the first link in the transmission system consists of a duplicate set of 2200-volt feeders, which are run in duplicate duct lines from the hydroelectric station, across Gatun Dam, and under Gatun Locks in tunnels, to the first step-up substation on the east side of Gatun Locks at the upper level.

The function of the Gatun substation is to transform the electrical energy received at 2200 volts to energy at 44,000 volts, at which potential it is transmitted by a 47-mile duplicate transmission line to three other large substations and to two small substations. The transmission line parallels the right-of-way of the Panama Railroad.

One of the large substations is at Miraflores, 37 miles distant from Gatun. Miraflores substation possesses a double function; first, to step-down the electrical energy from 44,000 volts to a usable pressure of 2200 volts for local distribution to the Miraflores and Pedro Miguel locks; and second, to serve as the interconnecting link between the entire transmission system and a 6000 kw. reserve steam generating station at Miraflores.

The Miraflores steam station is separated from the substation by less than 100 ft., and will be used in event either of failure of the hydroelectric station, or of a heavy draft of water from Gatun Lake in an extraordinary dry season. At such times the normal step-down transformation at Miraflores substation is reversed, and the substation becomes a step-up plant. During the period of Panama Canal construction, the Miraflores steam station has been operated to furnish power to the Pacific locks, and to the plant at Balboa, Ancon, and Panama.—The Canal Record.

Synthetic rubber is made by the action of chlorine and sodium on amyl alcohol (fusel oil) which is derived from potato starch. Isoprene is first produced by the action of chlorine on the alcohol, and it, in turn, is transformed into rubber by the catalytic action of sodium.

INDUSTRIAL USES OF FUEL OIL

BY F. B. DUNN.

(Continued.)

Heaters.

The object in atomizing the oil is to break it up into minute particles, and thus expose the maximum surface to contact with the air. This is accomplished in the burner, but to make the operation efficient, the oil must first be heated. A further advantage of heating the oil lies in the fact that oil will burn more quickly at a high temperature, because the hydrocarbons are more readily separated. With the atomizing type of oil burner, the oil is heated to a temperature of about 125 degrees F. In the mechanical type, the temperature varies from 150 degrees to 220 degrees F.

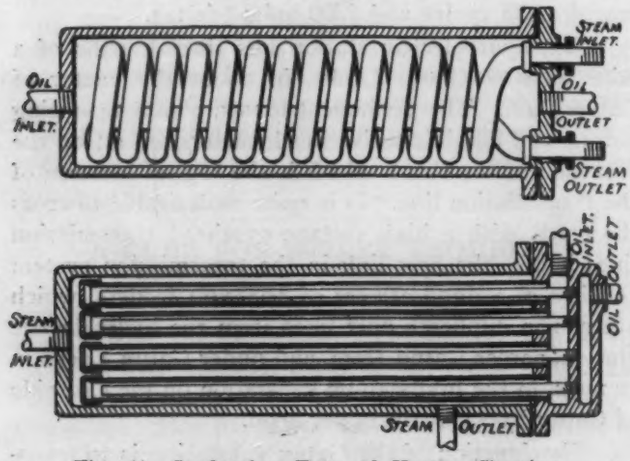


Fig. 41. Condensing Type of Heater, Showing Detail of Coil.

A few of the many types of oil heaters in use, are illustrated herewith. The upper part of Fig. 41 shows a copper coil through which steam is circulated; the coil is submerged in a vessel through which the oil is pumped. The large heating surface of such a coil makes it an efficient type of heater. The lower part of Fig. 41 shows the condensing type of oil heater. The oil passes through the oil inlet into a ¼ in. pipe, which is enclosed by a ¾ in. pipe. Upon reaching the end of the inner pipe it passes into and returns through the annular space between the inner and outer pipes to the discharge chamber. Steam fills the body of the heater and an outlet for the condensed water is placed at the bottom.

Fig. 42 illustrates a corrugated type of oil heater, in which the oil passes through the corrugated inner chamber and is heated by the steam that passes into the body of the heater. Fig. 43 illustrates a multiunit oil heater, constructed of extra heavy wrought iron pipe. The oil passes hrough the inner pipe and is heated by the steam in the annular space between the two pipes. It will be noticed that all joints are made up on the outside. The return bends are extra heavy brass castings for the oil pipes and standard high pressure ammonia fittings for the steam connections. This type of heater can be made of as many units as may be required, and can be connected in duplicate so that either heater can be cut in or out, as desired.

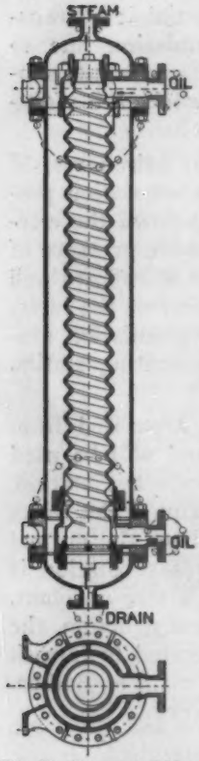


Fig. 42. Corrugated Metal Type of Heater

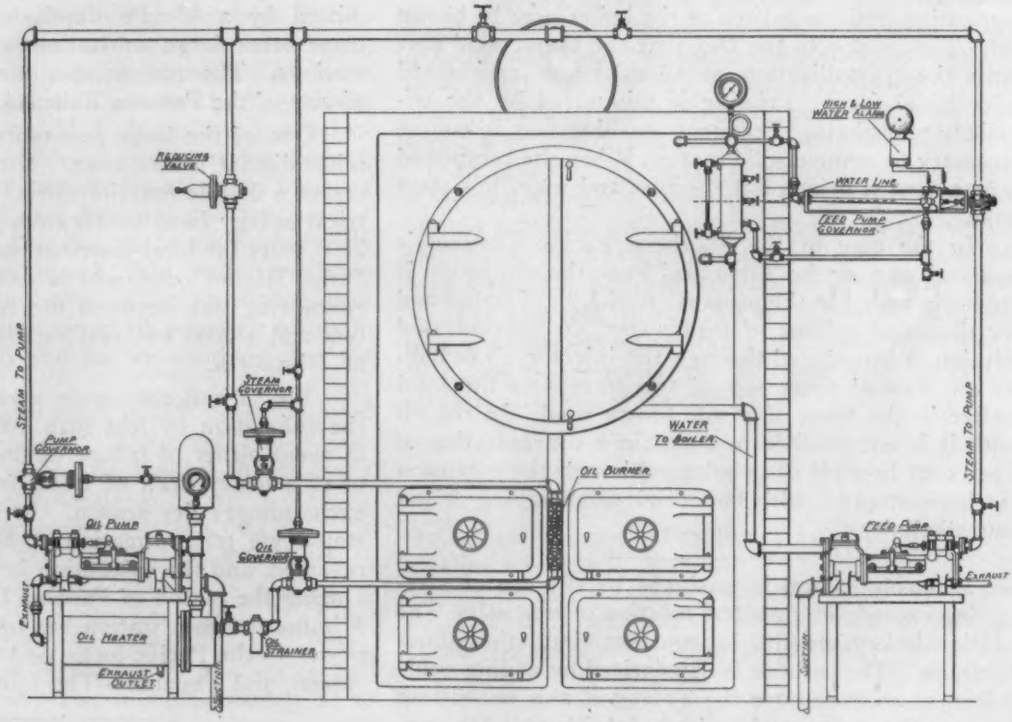


Fig. 45. Witt Automatic Regulator.

Regulators.

Figs. 44 and 45 illustrates the method of applying automatic regulators, to an oil burning system. The pressure of the steam is regulated by means of a governor that determines the amount of oil and steam fed to the burner. The operation is positive and sim-

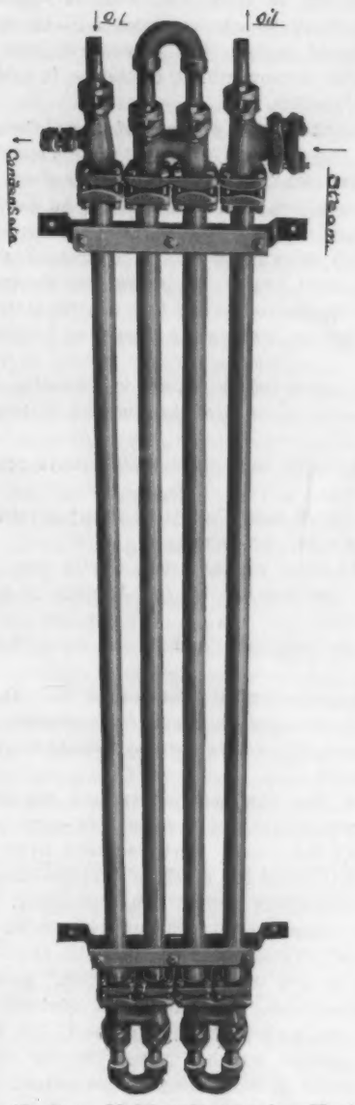
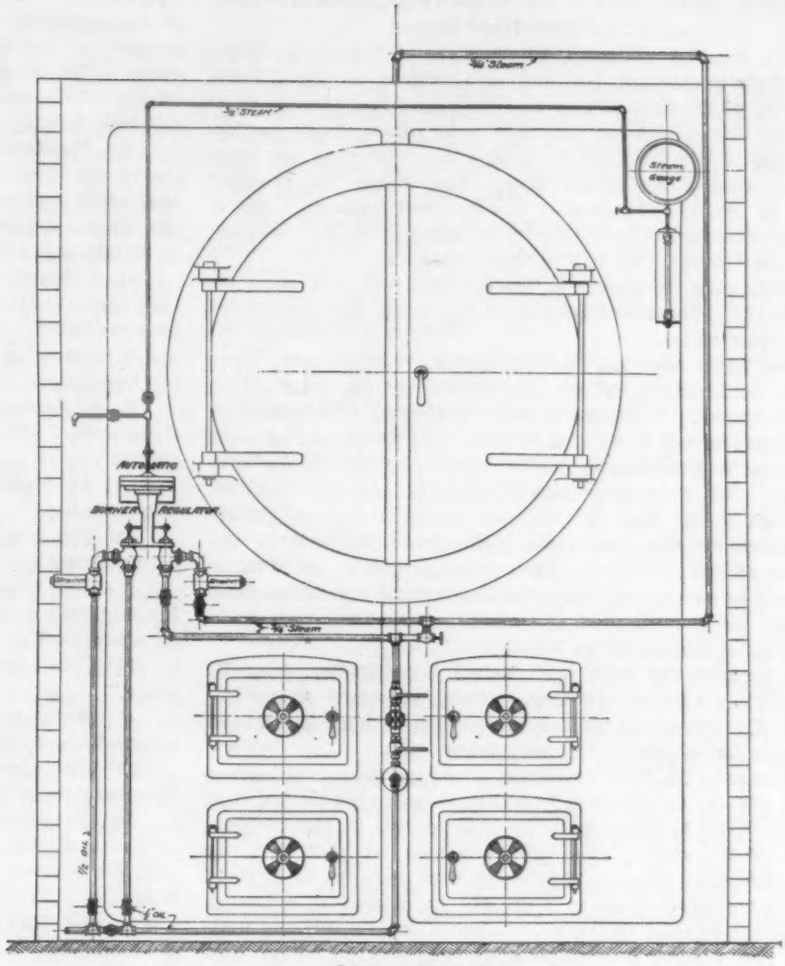


Fig. 43. Coen Multi-unit Annular Heater



APPLICATION OF WILGUS AUTOMATIC OIL BURNER REGULATOR TO OIL BURNER.

Fig. 44. Wilgus Automatic Regulator.

ple. The regulator is set at the desired pressure and connected to the steam line from the boiler; a rise or fall in the steam pressure moves the diaphragm of the regulator, causing the spindle to open or close a valve, and thus regulating the supply of oil or steam to the burner.

There are many types of regulators on the market. Some control the steam and oil supply, while others regulate the steam and oil, and also the air for combustion. Attempts have been made to regulate the burning of oil by means of thermostats, placed either on the burner or stack. The former type has never proved satisfactory, and the latter requires constant attention, as it gets out of order due to smoke.

(To be continued.)

The efficiency of water wheels, which are new and clean, has been found to be nearly, if not quite, 85 per cent as a maximum, and is quite certain to be 83 or 84 per cent. Wheels are generally so made that the maximum efficiency is at 70 to 85 per cent gate opening on account of the probability that the gate will not be wide open as a general thing. In practice it is impossible to keep wheels clean. They become rusty, coated with dirt, and more or less clogged with debris. As the supply of water in most cases is variable and small at times, the usual position of the gates is likely to be at such a point that the average efficiency will not be over 75 per cent. The gate opening which corresponds to this efficiency is from 45 per cent to 55 per cent.—F. W. Dean.

Efficiency, to the engineer, means the ratio of the useful result produced to the effort utilized in producing it. To the public in general it simply means doing things better. Inasmuch as the object of increasing the efficiency of an industrial operation is to reduce the cost of that operation, the only real measure of the efficiency with which the operation has been performed is found in the effect on its cost. The essential elements of a reliable cost system are a knowledge each day of (a) what was done the day before, (b) who did it, and (c) what was paid for it. The only sure way of knowing whether these returns are correct is to know beforehand (a) what should be done the next day, (b) who should do it, and (c) what should be paid for it.—H. L. Gantt.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION CONVENTION.

On Tuesday afternoon 50 members of this organization and their guests left Portland in a private car for Albany, Oregon, where they arrived at 5:30 p. m. Immediately upon arrival this delegation together with others from various portions of the state sat down to a fine dinner in the main dining room of the Albany Hotel. This dinner was presided over by Mr. J. F. Werlein of the Portland Railway, Light & Power Company. This meal was interspersed by "stories" and the "joshing" of the various members.

Following the dinner a "bowling contest" took place between the jobbers and contractors in which the contractors were easy victors.

On Wednesday morning the meeting was called to order by R. G. Littler, president, in the Convention Hall of the Hotel Albany. Mr. Werlein made a few remarks regarding electricity in which he said in part: "It is the one element we receive from above and it signifies purity in its true sense. The ease with which electricity can be handled, although it can become the most destructive force known, convinces me that this same destroyer of life, will be the source of eternal life for man. Your president, Mr. Littler, appeals to me through his quiet unassuming manner and the results he has attained as president of this organization stand as a monument to his ability."

The president then read letters from Messrs. John R. Galloway, president, and Geo. Duffield, secretary of the National Electrical Contractors' Association, wishing the Oregon organization a successful convention.

Mayor L. M. Curl, of Albany was introduced and gave a short address of welcome, in which he said that he felt that the O. E. C. A. would be a pertinent factor in the development of the state. Also he appreciated the fact that the convention had come to Albany, as they were proud of their city and desired to show it off, and he desired to extend a standing invitation to the association to come again any time they saw fit and stay as long as they desired. President Littler responded to the mayor's hearty welcome in a few well chosen words, expressing every one's feelings that Albany had been a most genial host.

J. L. White, local manager of the Oregon Power Company, Albany, then read his paper on "The Relation of the Contractor and Dealer to the Central Station," as appears on page 552.

This paper was discussed by Messrs. F. C. Green, R. G. Littler and A. C. McMicken, who brought out the fact no purely electrical store had been able to merchandise electrical goods unless they were connected with a central station. The idea of an electrical store was admitted as correct but the central stations desire to be "shown," before they are willing to turn the business over to independent effort. Mr. Tomlinson said he visited the New York Edison Company's New York store last year and they were only carrying samples and turned the orders over to dealers and contractors but it was not satisfactory.

Mr. Hill said he had been a contractor and could appreciate the views of contractors. When the time comes that the various devices can be placed in the hands of the consumer by an independent dealer, he said the central stations would be glad to give up merchandising. He thought, personally, that a great deal of education was needed by the public along these lines and that personal solicitation from house to house was the only way to procure results. The Los Angeles Edison Company, is using this method now. Not all the houses at the present day are wired and that also handicaps the sale of electrical appliances. Closer relations should be maintained between the central stations and the contractors. In Portland, as in many other cities, central station competition caused the central stations to stay in the business. He suggested that the contractors furnish the central stations with a printed card giving the names of all reputable contractors, so that the solicitors for light and power could give them to owners who desired work done. This method would relieve the power company of recommending any specific person, which, of course, is seldom allowed by any central station.

Mr. McMicken brought up the subject of complaints of customers which were due to poor work of some electrical contractor and said that generally the central station got the blame, and he thought that some way should be devised to relieve this situation.

M. J. Walsh said all he wanted was a chance to show the central stations what could be done in electrical merchandizing. Mr. Skeen desired to say that central stations had done more in the past for contractors than they had done for themselves.

P. A. Young then presented a paper on "Credits and Collections." Mr. Young's paper brought out the following points:

(1) All problems divisible into parts which parts are of easy solution.

(2) The sale of goods is easy, but true ability is shown by collecting the money after the sales.

(3) Credits are influenced by (a) Local Conditions; (b) Investigation of person desiring credit; (c) Amount of capital a firm desires to invest.

(4) Credit men to be successful must have good "horse sense."

(5) Many times merchandising companies find themselves doing a "banking business" in their credit system.

(6) The whole system of credits can be summarized as "Common sense classified."

Mr. Tomlinson said that the contractors had one kind of business, that the determining of credits was very difficult, for instance, orders for repair work received over the telephone. Mr. Werlein thought the spirit of "get-the-money" was wrong, that the contractors should use diplomacy. M. J. Walsh said that his company was getting references before allowing credit. Mr. Young said he thought an error was made many times in not sending out a "high" enough class man to make collections. Mr. Poppleton advised the use of the State Lien Law, for collection purposes. Mr. Holkenbrink raised the question whether power wiring could be "lien" against the owner of a building if the tenant was irresponsible. Same question regarding light wiring. Mr. Oberender stated that the lien laws of Oregon were deficient and he was of the opinion that the "power" wiring could not be made a "lien" against the owner, as it was a "fixture" of the tenant but that "light" wiring could be.

President Littler appointed committees on Resolutions, Nominations, and Membership.

Mr. Weber gave a short talk covering the Underwriters' desire to maintain a high standard of efficiency in electrical construction and desired to see the O. E. C. A. succeed.

Mr. John F. Ryan presented a paper on "The Jobber and the Contractor," as appears on page 553.

Messrs. Green, Skeen, Schrof and Hill discussed this paper. Mr. Hill said he thought the contractors' association should guarantee its members. Mr. Ryan thought that the consumer is given contractors' prices sometimes, which is not the desire of the jobber, this results from carelessness on the jobbers' part, also the practice for years has been to consider "isolated plants" entitled to contractors' discounts.

Mr. McMicken of the Portland Railway, Light & Power Company made a short address in which he brought out the following points. In his experience of 12 years in the electrical work in Portland, he noted a wonderful improvement in the contracting business. This progress has been due to individual effort, but more to the co-operative efforts of all those interested in the business, and it is too bad so many failures have taken place in the past, and that the O. E. C. A.

had not been organized many years ago to educate contractors along business lines. He urged the adoption of a code of ethics by the association which would, if adhered to by all the members, automatically attract business to them.

Mr. Caulfield suggested sending a delegate to the Commonwealth Conference held in Eugene to suggest a change in the present lien laws of the state.

In the afternoon a party was taken through the substation and filtration plant of the Oregon Power Company. The filtration plant has a high efficiency, water being received with 7000 bacteria to the cubic centimeter and after filtration it contains 72. The best well water contains 50 to 70 bacteria to the cubic centimeter.

At 2 p. m. there was a business meeting of the association at which time a consolidation of the "Portland" and "Oregon" Electrical Contractors' Associations was made into the Oregon Electrical Contractors' Association. A delegate was appointed to attend the Commonwealth Conference in Eugene to urge change in the lien laws: An effort through the legislative committee of the association to get the proper legislation at the coming session so that the contractors for electrical wiring and equipment be let separately and not included in a lump contract for the building. At present Pennsylvania has such a law. The following officers were elected for the ensuing year:

John Tomlinson of Portland, was elected president of the association for the ensuing year and other officers were named as follows: First Vice-president, Harry Sroufe of Portland; Second Vice-President, Joseph H. Ralston of Albany; Third Vice-President, Lester Armitage of Corvallis; Secretary-Treasurer, J. W. Oberender of Portland To serve with these officers on the executive committee, S. C. Jaggar and F. K. Green, both of Portland, were chosen.

Those registering at the convention were as follows:

W. H. S. Hill and wife, Northwestern Electric, Portland, Ore.
Geo. A. Boring, Pacific States Electric Co., Portland, Ore.
F. C. Todt, Pacific States Electric Co., Portland, Ore.
Owen Osborne, Portland Railway L. & P. Co., Portland, Ore.
J. E. Werlien, Portland Railway L. & P. Co., Portland, Ore.
A. M. Sherwood, General Electric Co.
F. O. Broili and wife, Northwestern Electric Co., Portland, Ore.
L. B. Zigwart, Hunter Electric Co., Eugene, Ore.
F. C. Green, E. L. Knight & Co.
G. A. Kumbler, Pacific States Electric Co.
A. M. Sherwood, Jr.
M. J. Walsh, M. J. Walsh & Co., Portland, Ore.
Basil Witzig, General Electric Co., Portland, Ore.
J. H. Ralston, Ralston Electric Supply Co., Albany, Ore.
R. R. Poppleton, Rep. Crocker-Wheeler Co., Portland, Ore.
R. C. Littler, West Coast Engineering Co., Portland, Ore.
J. R. Tomlinson, Pierce-Tomlinson Co., Portland, Ore.
P. A. Young, Albany, Ore.
L. M. Curl, Mayor of Albany.
C. P. Osborne, Portland, Ore.
E. H. LeTourneau, Portland Railway L. & P. Co.
F. D. Weber, Underwriters Eq. Ra. Bu., Portland, Ore.
H. F. Holkenbrink, Portland Electric Maintenance Co.
F. Cole, Armitage & Co., Corvallis, Ore.
W. H. Smith, W. H. Smith Electric Eng. Co., Portland, Ore.
E. W. Pierce, Pierce-Tomlinson Co., Portland, Ore.
A. C. McMicken, Portland Railway L. & P. Co.
J. B. Hope, Hope Electric Co., Lebanon, Ore.
O. B. Penrose, Fobes Electric Supply Co., Portland, Ore.
E. L. Knight, E. L. Knight & Co., Portland, Ore.
C. C. Crawford, Portland Railway L. & P. Co.
T. F. Pierce, Rep. M. J. Walsh of Peerless Lamp Wks., Portland.
O. B. Helt, General Electric Co.
J. A. Ryan, Western Electric Co., Portland, Ore.
F. E. Davis, Western Electric Co., Portland, Ore.
W. E. Flack, Marshall-Wells Hardware Co., Portland, Ore.
A. J. Cogley, Telephone Electric Eq. Co., Portland, Ore.
G. L. Priest, Jobber, Portland, Ore.
S. C. Jagger, Morrison Electric Co., Portland, Ore.
C. R. Dederick, Fobes Electric Supply Co., Portland, Ore.
R. W. Stubbs, A. B. Stubbs Electric Co., Portland, Ore.
B. E. Lucas, A. B. Stubbs Electric Co., Portland, Ore.
Carl F. Caulfield, Labor Commissioner, Portland, Ore.
Mrs. D. B. Sherve, Stayton Electric Co., Stayton, Ore.
B. J. Borcourt, Borcourt Electric Co., Portland, Ore.
H. H. Burgy, Burgy Electric Co., Portland, Ore.
S. W. Peterson, Rep. Cutler-Hammer Co., Portland, Ore.
W. O. Fouch, Western Electric Works, Portland, Ore.
A. N. Derby, John A. Robeling Sons Co., Portland, Ore.
J. H. Sroufe, NePage-McKenney & Co., Portland and Seattle.
Robert Skeen and wife, Skeen Electric Co., Portland, Ore.
R. F. Walton, Newton Electric Supply Co., Albany, Ore.
F. E. Myers, H. M. H. Electric Co., Portland, Ore.
A. S. Halls, Pacific Fire Extinguisher Co., Portland, Ore.
J. W. Oberender, Secretary of O. E. C. A.
H. W. Scott, Scott Electric Co., Astoria, Ore.
S. C. Luckey, Astoria, Ore.

THE RELATION OF THE ELECTRICAL CONTRACTOR TO THE CENTRAL STATION.

BY J. L. WHITE.

In preparing this paper I realized that the subject is one that has been under discussion time and again. Nevertheless I feel that it is one of great interest and I hope that the points which I will endeavor to bring out will promote some serious discussion.

As it is today, in a great many instances, the words contractor and dealer mean practically the same thing. The majority of contractors are dealers, to a certain extent. So in speaking on the above subject I include the dealer in the same class with the contractor.

It is a little embarrassing to talk on the subject of the relations of the contractor to the central station, for it would seem that the interests of both are so interwoven as to permit of little discussion. Surely the central station is interested in the success of the contractor, and therefore a condition exists that practically demands they should work together.

The story of the central station is a history of electric lighting in this country, together with the enormous kindred business interests which have been created as a result of these operations.

The electrical contractor was not a factor in the early period of the business because his work as a business did not exist. The companies were the entire electrical industry within themselves, for they erected and operated the lighting plant, constructed their lines and finally installed the wiring on the premises.

After a time, the great expansion and the consequent necessity for greater economies suggested a separation of the inside construction, or wiring end of the business, from the other operations of the plant, and brought the electric wireman or contractor before the public in the industrial life of the community.

This expansion brought about a number of other subdivisions in the field; notably the manufacturer, the jobber and the consulting engineer. The contractor is the only one of the units that is brought in direct contact with each of the others, as well as, in the opinion of the central station, the most important of all, the customer. Every possible effort must be made on the part of the contractor to secure and retain the good feeling of the customer. He should have the highest aims for the conduct of his business, treating his customers fairly, as well as keeping in mind constantly that the class of work that he does should be of such an order that it will always stand to his credit in the future. The representatives of the lighting company know only too well that the contractors do their utmost to secure service for them and I think that the central stations should always be willing to place at the disposal of the contractor their engineering data and also their engineers if necessary.

As I have already stated, the business of the contractor in the earlier stages of the industry consisted of wiring installations and the furnishing of such inexpensive lighting fixtures as were necessary at that time. Heating devices and the various other appliances that we have today were then unknown. I believe the time is fast coming when the retail business will be taken care of by an electrical dealer operating a neat, well appointed store in which he makes suitable displays and demonstrations in the various lines of electrical devices and apparatus as appeal to the shopping trade. He will do practically no contracting but will confine himself strictly to retailing. He will leave the installation end of the business to the general contractor who will conduct his business from an office building. These conditions of course will only obtain in cities of the larger size. In many smaller places where the contractor is compelled to

carry on a merchandizing business we find most complete lines and these stores compare favorably with the best stores in other lines in our cities.

In the very nature of things there should exist a co-operative relationship between the contractor and the central station, and these two words sum up the situation. There is unquestionably a mutuality of interests between the two. It is true that this co-operative tie that binds the business of the contractor and the central station has not as yet been pulled taut. But the trend is in the right direction and while ideal conditions in every instance are not yet obtained, there can and should be closer and more friendly relationship. A closer co-operation between the central station and the contractor is sure to benefit both.

The smaller contractor in the less prosperous neighborhoods is chiefly engaged in small installations in cheap dwellings. If the central station will help this class of contractors by referring wiring prospects to them they in turn are, I am sure, ready to reciprocate. It is this kind of team play and good feeling that should be cultivated.

To my mind the one obstacle that has blocked the way to the contractor's success and for that reason has a bearing in this paper, is the competition from the central stations, due to the giving away of current consuming devices or selling them below cost. This is an age of specialization and I think that the central station should be solely the supplier of energy. Electric wiring and contracting is also a business in itself and I do not believe that the average central station can handle wiring contracts or sell appliances as satisfactorily as a contractor. The general public is skeptical about any article the central station may sell, fearing that such contrivances will use the maximum amount of energy and not the minimum. The majority of people cannot see why the central station should want to recommend devices which use the least amount of energy when it is its business to sell energy.

Another feature in a plan of co-operation between the contractor and central station is in the matter of each endeavoring to adjust the complaints made against the other. It frequently happens that the contractor or the company is in a position to satisfactorily adjust a complaint or remove the antipathy arising from some real or imaginary grievance.

There are many reasons for the greatest of co-operation between the contractor and the central station and the one thing that will accomplish the most satisfactory results is confidence. Confidence is the keynote of any attempt to raise the standards of the electrical industry. Confidence comes with an understanding of what the other fellow is doing.

Recognizing the pulling power and the force of combined effort toward a common end there have been many efforts made to unite the several lines of electrical interest on common ground. The Society for Electrical Development is one of the more recent and important of these combinations. I am entirely aware in suggesting this thought that many harmonious plans are being devised and even carried out. Contractors and central stations in many communities are working in complete harmony, with good results to both.

As to the part that the central station should play in this co-operative relationship, I suggest, first, a trained sales force co-operating with the contractor in stimulating demand for energy-utilizing devices; second, no direct sales by the service company; third, frequent conferences with the contractor as to new possibilities which are always arising for extension of the use of energy. By this method misunderstanding will be minimized and results in profits to contractor and lighting company and satisfaction in service on part of the public will be augmented.

HOW CAN THE ELECTRICAL CONTRACTOR BENEFIT HIMSELF AND THE ELECTRICAL BUSINESS AS A WHOLE FROM THE STANDPOINT OF A JOBBER.

BY JOHN F. RYAN.

The subject assigned to me is one of such vast importance that it has been given a great deal of thought and consideration by the electrical jobbers and one which is of vital interest to not only the contractor himself but to all the other branches of this great and rapidly developing electrical industry.

The contractor is rapidly developing into the medium and to a great extent has been recognized as the proper channel through which the central station, the jobber and the manufacturer is to reach the ultimate consumer. He is also to be recognized as the most important factor and must be looked to for the maintenance of the standard of quality as set forth by the National Board of Fire Underwriters, which board has been one of very great importance toward the development of safe and sane current consuming devices and one of the main factors in developing the electrical contracting business from that of a boy's task to the important position which it now holds in the progress of electrical development. With these facts brought so forcibly to our attention the success of the contractor, as well as all the other branches of the industry, resolves itself into the simple answer of co-operation. By co-operation I do not mean the banding together of the electrical contractor for the purpose of regulating or controlling prices, nor is it intended for the purpose of forcing his weaker brother, who is not a member of his association to discontinue business. This is not co-operation in its true sense.

By co-operation I mean that it is the duty of every electrical contractor to co-operate with his fellow contractors by becoming a member of any organization whose object is the up-lifting and development of his particular line of business. There are of course a great number of contractors who at the present time can not realize the benefits to be derived from such a co-operative movement. It then becomes the duty of the broad minded co-operative contractor to try and persuade his smaller and narrower minded fellow worker to become a member of his association that he may also share the benefits to be derived from such co-operation.

It must be remembered, there is still much good standing timber which is absolutely necessary for the proper construction of your association and before your task is completed this timber must be utilized. On the other hand, there are a number of so-called contractors, who cannot see beyond the sphere of their own little business and who never can be educated to co-operate with their fellow contractors. This type of contractor is not only a detriment to the contracting business but to the electrical industry as a whole. He is generally a man who knows nothing about his overhead or cost of doing business. He takes his contract at such a low margin of profit that he must purchase the cheapest class of material. He is forced to do cheap work, with the result that he becomes a thorn in the side of the legitimate contractor who tries to do good work. The central station must stand the brunt of his poor work and he is a source of continual trouble to the National Board of Fire Underwriters. This contractor continues along these lines until such time as he becomes so heavily involved that his career as a contractor soon spells failure, with the result that the jobber must carry the burden of his failure. This contractor should be shunned by all branches of the electrical business as his work is destructive rather than constructive.

With the electrical contractors organized in such an organization, they should educate their members for the economical handling of their business by the interchange

of experiences relating to their contracting problems. They should encourage their members to work in harmony with the National Board of Fire Underwriters and uplift the standard of the business by using nothing but approved quality material. They should devise ways and means for the proper distribution of their wares to the consumer by taking a personal pride in the appearance of their retail store, fixing it up in a manner to demand the respect of the retail commercial world which rightly belongs to it, thereby demonstrating to the central station, the jobber and the manufacturer that they are capable of properly handling the distribution of current consuming devices which play such an important part in the existence of the central station, thereby releasing the central station from the responsibility which they owe themselves, the jobber and the manufacturer for the placing of these current consuming devices before the ultimate consumer. They should endeavor as nearly as possible, to give their support to the electrical jobber distributing in the territory in which they are located, for without the support of the electrical contractor, the jobber is left to choose between the discontinuance of his existence as a jobber or look to other fields for the marketing of his wares. If the jobber should be forced to discontinue on account of the non-support of the electrical contractor, it would force every electrical contractor to become a jobber, forcing him to greatly increase his investment in stock, thereby increasing his overhead to such proportions as to retard the progress and development of the business and those of you, who could not for financial reasons carry the tremendous investment necessary to properly conduct the business would be forced to discontinue.

Inasmuch as the jobber is as necessary to the existence of the contractor and the central station as the contractor and the central station are to the existence of the jobber, why not let us co-operate through our different associations for the mutual benefit of the industry as a whole?

Those of you, who have been in the business for any great length of time, if you will stop and retrace a few years of your life, you will recall when the central station was not only the generating plant but also the jobber, contractor and retailer. The electrical business then was merely in its infancy. The central station considered the jobber as well as the contractor illegitimate competitors. They were never intended to be nor were they necessary for constructing the wheel of this great electrical industry but like all other commercial industries it began to expand and grow at such a rapid rate that it was soon beyond the control of the individual or central station. The jobber became a necessity, he was also recognized by the manufacturers as the best and cheapest medium through which to market their products for the reason that by incorporating under one organization the products of a great number of manufacturers, he was able to greatly reduce the cost of placing the manufacturers' products before the public.

The central station, like the manufacturer, soon began to realize the importance of the electrical jobber. It enabled them to greatly reduce their investment in stores. It enabled them to secure prompt delivery on the material which they needed. They came to be recognized as the foremost advance agents in the placing of new current consuming devices before the public and in this way the electrical jobber began to work into the good graces of the central station and is today looked upon as a very important position of their industry.

Not unlike the jobber is the electrical contractor. At first they were forced in keen competition with the central station until by concentrated effort and specializing in their particular line, they were enabled to successfully compete and prove to the central station that they were in better position to successfully serve their customer than the central station themselves. The central stations were quick to note the progress and advancement of the contractor until today nearly all the central stations in the country have discontinued their wiring departments and concentrated their efforts in other directions.

It is with great interest that I look forward to the time —and I do not think that time is very far distant—when the electrical contractor through his co-operation with all the other branches of the electrical business will be enabled to prove to the central station, the jobber and the manufacturer, that he is the true and legitimate channel through which we are to reach the ultimate consumer by the well equipped retail electrical store.

When conditions such as these exist, the central station will become a central station in its true light; the contractor will become a contractor; the dealer will become a dealer and the electrical jobber will become an electrical jobber in every sense which the word implies.

CONSERVATION OF WESTERN WATER POWER RESOURCES.

Strong objections to the provisions of the bill passed by the house of representatives at the last session of Congress and now before the senate committee on public lands "to provide for the development of water power and the use of lands in relation thereto and other purposes" were set forth by E. A. Wedgwood of Salt Lake City in a paper on "Conservation of Western Water Power Resources," which was distributed among members and delegates to the seventeenth annual session of the American mining congress. The bill is impracticable from a business standpoint, the paper declared, and insufficient assurance of co-operation is given states and private investors by the federal government in the provisions of the bill. "Conservation of natural resources demands immediate development of available water powers. Three factors control the development of western water power resources:

"The right to the perpetual use of flowing waters;

"The right to occupy the necessary public lands for dams, power houses, water conduits and pole lines;

"Money sufficient to construct dams, water conduits, power houses and transmission lines."

By reason of the ownership of large bodies of land, valueless for other useful purposes, the paper argued, development of western states and the investment of capital is being retarded by the federal government which "apparently assumed to control water power development and therefore the progress and material welfare of these states."

"Ought the mere ownership of a few acres of desert lands give this power? All the lands in private ownership are subject to the law of eminent domain. If federal ownership does carry such power and the law of eminent domain does not apply to such lands, ought federal power over these lands to be used to retard the progress of a state and prevent the conservation of its natural resources?"

"It is believed that congress, in its wisdom, should at once provide that the respective states, through their citizens, may be on practical terms and conditions, just and fair to all interests, national, state and private, the use of the public lands to the extent necessary, whereby to wrest the power from the falling waters and thereby upbuild the state and advance the good of human kind during the present and future generations."

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The Antiquity of Irrigation

Progress is prone to forget its debt to the past. Many modern methods were foreshadowed by the ancients, and their experience can be applied with benefit to present problems. Especially is this true in reclamation and irrigation of arid lands, concerning which we may learn much from the ancient Egyptians. The story is well told elsewhere in this issue by Mr. A. E. Chodzko, as applied to the use of the rice crop as a profitable by-product in neutralizing alkaline soils. The subject is one which should be of interest to every central station serving an irrigation load.

The most progressive peoples of historical times have been instrumental in developing the art of irrigation. Irrigation was practiced before the dawn of history. Whether it originated in Asia, Africa, Europe, or even America, is difficult to determine. The faint records of the early Egyptian dynasties, the monuments of Babylon and Assyria, the ruins of Persia, India and China, and the relics of the Aztecs all show that irrigation was one of the first agricultural practices of mankind.

These antiquities also prove that little progress was made in the methods of applying water to arid lands until late in the nineteenth century. It is seldom realized that Brigham Young, the founder of the Mormon colony in Utah, was really the father of modern irrigation methods. One of his first acts, after reaching the present site of Salt Lake City in 1847, was to give "the soil a good soaking of water brought from the neighboring City Creek, through a plow furrow that served as a ditch." Laws and customs in the use of water, which remain as a model to the present day, were then created.

The most notable advances in irrigation methods since then have been contributed by engineers. Successful irrigation depends upon close co-operation between the farmer and the engineer. The engineer provides the means whereby the farmer may get the results. The engineer builds the dams, canals and pumping equipment which insure an adequate and dependable supply of water. The farmer uses the water to the best advantage in producing crops. Without proper co-operation the work of neither party is of full avail.

The "Jitney" Bus

As a new means of popular transportation the "jitney" bus, an automobile tram, has recently entered into active competition with the electric railways of the Pacific Coast, particularly in Los Angeles. These buses, many of them five-passenger cars, give frequent service at a five cent fare and are so heavily patronized as to make serious inroads in the traction company's revenue. In Los Angeles there are over a thousand men engaged in this business in addition to the regular taxicab service.

The situation is indeed strange that makes possible this competition with what is admitted to be one of the finest street railway services in the world. A justifiable excuse for their operation would exist if the transit methods were inadequate or if the charges

were exorbitant. Some are even bold enough to prophesy that this mode of transportation will eventually supersede the street car. Yet a moment's consideration will show the fallacy of this idea.

To begin with, this competition is a reflex of the hard times. Men who have nothing else to do are picking up a little money in this manner but will discontinue the service as soon as they get more remunerative employment. Consequently there is no likelihood of permanency. A heavy rain storm puts the machines out of business and the public necessarily patronizes the street cars. Service is now the great demand to be met by any public utility and is the point in which the jitney bus is weak.

Safety, also, is a modern requirement. The numerous automobile accidents testify to the need for more rigid regulation of this traffic, particularly on city streets already congested by vehicles engaged in normal pursuits.

Considering the large amounts spent by the traction companies in maintaining service and insuring safety some similar form of insurance should be required from those giving this transient transit facility. Corrective legislation is a probability of the immediate future and the "jitney" bus will pass into oblivion.

Treating Boilers

The poetic suggestion about the flowers wasting their sweetness on the desert air is called to mind by the interesting story of how a remedy was found for the ills to which the boilers in the Fruitvale power plant of the Southern Pacific Company were heir. After months of fruitless efforts in trying to stop pitting, and after thousands of dollars had been spent in tube replacement, a fortuitous discovery put an end to all the troubles. Furthermore, the find was most simple.

It seems that the same difficulties had been experienced by the U. S. Navy some years before. Wherever it was necessary to use saline waters for boiler feed purposes, a universal necessity for every navy but Switzerland's, an inexplicable and baffling corrosion of boiler tubes ensued. Lieutenant Commander Lyon, after months of painstaking research, came to the conclusion that such corrosion could be obviated by making the boiler feed water strongly alkaline. The medicine worked like a charm, and the "Oregon's" tubes were kept cleaner than the day of the trial trip.

Unfortunately the record of this worthy accomplishment was hidden away in a scientific tome and in danger of oblivion until brought to light by engineering research to find a cure for a similar disease in the Fruitvale plant. The conditions were so alike and the treatment so simple, that the navy compound was tried and has been used with marked success ever since, as is reported elsewhere in this issue.

The results of using this compound with some of the non-saline waters of the interior States would also be of interest. That this method of treatment should prove successful in all cases transcends all chemical experience. Correspondence on this subject is invited from our readers.

Police Ineffiency

A unique thought is suggested in a paper presented at the December meeting of the American Society of Mechanical Engineers by Mr. Henry Bruere of New York City that engineering methods could well be applied to increasing the efficiency of the police department of the average American city. "Scientifically the most neglected field of public service in America is the police department." He develops the fact that it is the function of the police to protect those institutions of civilization which it has been the prime purpose of the engineering profession to establish. This has usually been done by repairing the wear and tear of social friction instead of obviating the causes of that friction.

Briefly, he proposes that the fundamental principles of efficiency be applied to police administration. Standards, records and ideals are needed. He criticizes the military type of organization which submerges the initiative of the individual and makes possible the political control of police departments. He advocates that the rewards and the discipline be more in accord with the recognized dictates of scientific management.

The scientific methods which have evolved the Bertillion and finger-print systems of identification should be applied to other police problems, such as the control of traffic. Particular attention should be paid to the compilation of records and to their analysis in order to find means of preventing crime. While it is manifest that the existing product of past mistakes cannot be corrected by eliminating the conditions which caused them and that these criminals must be dealt with through the established penal machinery, the purpose of these suggestions is to prevent future crime.

A bureau of crime prevention is equally as important as a bureau of crime detection. The lack of preventive methods constitutes the essential weakness of police protection. It is characteristic of engineers to prevent trouble by anticipating it. Certain effects are invariably the result of certain causes. It is better to remove the cause than to try to cure the effect. Such anticipation is the essence of service. Lack of it is the main reason for police inefficiency. Here is a fertile field for engineering study. Some of the methods by which the engineer controls the forces of Nature may well be applied in controlling the forces of men. These forces need diversion into proper channels rather than repression. The science of police engineering is only a special case of the general science of human engineering—scientific management.

With such glaring examples of the inefficiency of the present methods of political control of municipal activities as are known to exist, the question of applying the same methods to the control of electrical or transit facilities should also interest the public. Would it not be better to improve the present branches of the public service than to take over new branches whose success are even more vitally dependent upon efficiency? At least let us increase the efficiency of our present public servants before giving them new tasks which are now efficiently performed by private owners.

PERSONALS

Henry Guilbert, of Guilbert Bros., electrical contractors, of San Jose, Cal., was a visitor in San Francisco during the week.

Chas. Noack, manager of the Coast Valleys Gas & Electric Company, Monterey, Cal. was a visitor to San Francisco during the week.

Ross Hartley, district manager Pacific States Electric Company, Portland, Ore., spent the latter part of the week in San Francisco.

E. A. Quinn, general superintendent San Joaquin Light and Power Company, Fresno, spent several days during the week in Los Angeles, Cal.

H. C. Goldrick, representative of Kellogg Switchboard and Supply Company, San Francisco, returned after a short trip to Southern California.

J. H. Newlin, purchasing agent of the San Joaquin Light and Power Company, Fresno, Cal., spent several days during the week in San Francisco.

O. F. Hanson, representative of the National Pole Company, Seattle, Wash., spent the week in San Francisco on a business trip of the coast cities.

Geo. Campbell, manager Reno Water, Light and Power Company, Reno, Nevada, has left for a business trip to Boston, Mass., and other Eastern cities.

A. E. Wishon, manager San Joaquin Light and Power Company, Fresno, who has been recovering from illness in San Francisco, left for home during the week with Mrs. Wishon.

R. E. Koons, chief surveyor with Burns & McDonneli, hydraulic engineers of Kansas City, Mo., was a recent Seattle visitor on his way to Everett, Wash., where his firm will supervise the construction of the municipal water works.

A. C. Macbeth has been elected vice-president and general manager of the Southern California Gas Company to succeed **A. C. Balch,** who recently gave up the active management because of poor health. Mr. Balch will continue his duties as a director.

O. A. Schlessinger, representative of the United States Light and Heating Company, San Francisco, has returned after a month's trip to the factory at Niagara Falls and through the East. He reports business conditions as showing a tendency toward improvement.

Francis V. McGinness, sales engineer of the Edison Storage Battery Company, Orange, New Jersey, has been appointed assistant manager of the railway department, taking the position of William F. Bauer who was recently made manager of the company's Chicago office.

John A. Britton, vice-president and general manager of the Pacific Gas and Electric Company, is one of several representatives of Western power companies now appearing before the Public Lands Committee of the United States Senate in the hearings on the administration water power site leasing bill.

C. B. Hunt, formerly wiring-device specialist of the General Electric Company at Chicago, has been appointed Pacific Coast manager of the Robbins & Myers Company of Springfield, O., and will have charge of the company's exhibit at the Panama-Pacific International Exposition, after which he will maintain permanent offices in San Francisco.

John Tomlinson of Portland, Oregon, has been elected president of the Oregon Electrical Contractors' Association; **Harry Stroufe** of Portland being first vice-president, **Joseph H. Ralston** of Albany, second vice-president, **Lester Armitage** of Corvallis, third vice-president; **J. W. Oberender** of Portland secretary-treasurer. The other members of the executive committee are **S. C. Jagger** and **F. K. Green,** both of Portland.

MEETING NOTICES.

Los Angeles Section, A. I. E. E.

An interesting and well-attended meeting of the Los Angeles Section of the A. I. E. E. was held in the lecture hall of the Chamber of Commerce on Tuesday evening, December 8th, and was presided over by Chairman Pyle. The meeting was devoted to the reading and discussion of papers on the various types of storage batteries and their applications. The first paper was read by I. R. Solomon on the "Lead Storage Battery," and he was followed by James F. Rogan, who exploited the merits of the Edison Alkaline Storage Battery. The lively discussion which followed was opened by the reading of a paper by Harry N. Sessions and brought out many divergent views regarding the availability of storage batteries for central station service and vehicle operation, which was participated in by Messrs H. W. Harrison, R. C. Cates, H. A. Barry, F. B. Lewis, Ph. Taylor, E. R. Northmore and the chairman. These papers will be published in an early issue.

Oregon Society of Engineers.

There was a special meeting of the Oregon Society of Engineers in room B of the Public Library, last Friday evening (December 4th) to consider means for establishing a reading course for the younger engineers and in other ways enlarge the work of the library and the society. Material progress was made in getting this matter into final shape. The regular Monday luncheon club met in the Crystal dining room of the Benson Hotel, Portland, Oregon, December 7th, and listened to an address by Richard W. Montague on "Municipal Ownership and the Scientific Spirit." Mr. Montague said that he had attended the conference of municipalities in Seattle and listened to the discussion on this question and he decided "that there was more 'heat' than 'light' thrown on the subject." He said the thing that engineers should do, on this great economic question, was to handle it scientifically and truthfully and actually get to the bottom of the question, eliminating all passion, prejudice, politics, etc., that now was so apparent in the papers and discussions on the subject presented at the present time. He said he would not believe the figures submitted by either faction, on the question of municipal ownership, due to the fact that it was apparent that the matter was not being attacked by all concerned from a truly scientific basis with one ideal in view of solving the question on its economic value to the community as a whole. He felt that a scientific body of engineers should have it within their power to make this purely scientific study of the question of municipal ownership. The chairman of the day was Edwin H. Taylor, superintendent of construction water bureau, Portland, Oregon.

Los Angeles Electric Vehicle Meeting.

The monthly meeting of the Los Angeles Section of the Electric Vehicle Association of America was held on December 2nd at the Jonathan Club Chairman J. Harry Pieper presiding. Reports were received from the several committees. The membership committee, H. F. Kister, chairman, reported progress and presented two applications for associate membership. The garage committee, J. O. Case, chairman, reported having had several meetings with Mr. Standish L. Mitchell, secretary and general manager, Automobile Club of Southern California. This club will show on their road-maps the location of all charging stations for electric vehicles. It was voted that Mr. Mitchell be elected an honorary member of the Electric Vehicle Association of America. The attendance and publicity committee, A. T. Smith, chairman, reported that each member had been telephoned to on the morning of the meeting in order to bring out a good attendance. The result was shown by an attendance of 33 members and 5 guests. The exhibition committee, C. H. Carter, chairman, reported that they were co-operating with the papers and program committee, and would have an exhibition at the next meeting.

Mr. I. R. Solomon, one of the members, made a very strong impromptu talk on practical co-operation.

Mr. Volney S. Beardsley described in detail the plan for a week-end trip for Beardsley electric owners, a special prize beng offered for those covering the greatest number of miles.

Mr. H. G. Morse, a member of the Electric Vehicle Association of America from Vancouver, now located in Los Angeles, described conditions in Vancouver and stated that co-operation among dealers was conspicuous by its absence, shown by the fact that in a city of 100,000 population there are but 37 electric vehicles.

George B. Muldaur, manager field co-operation of the Society of Electrical Development, described in an effective manner the work outlined and being accomplished by this organization. His address was most interesting and instructive. Mr. Muldaur was much impressed with the attendance and enthusiasm shown at the meeting. The next meeting will be held Wednesday, January 6, 1915.

The Jovian Electrical League of Southern California.

The weekly luncheon of the League held at Christopher's, on Wednesday, December 9th, was attended by about 150 Jovians and more than 15 guests, the majority from San Francisco, who appeared much impressed by the enthusiasm and co-operative good-fellowship displayed by the Southern members of the Order. This was evidenced by the remarks of Director Cudmore, who addressed the Jovians in his characteristic snappy fashion. R. G. Berle was chairman of the day and he had provided a splendid musical program as well as an interesting talk on "Transportation Development as Applied to Los Angeles," delivered by E. L. Lewis, superintendent of the Los Angeles Railway Company. Prefacing his talk by the statement that his company has done two million dollars' worth of paving in Los Angeles, the speaker told his hearers something of the growth of the system and its place in the life of the community.

"The Los Angeles Railway," he said, "has 4500 employees and a monthly payroll of $300,000. On all late franchises 2 per cent of the gross receipts go to the city, while State taxes take about 5 per cent of our gross receipts."

Regarding the alleged overloading of cars, Mr. Lewis pointed out that the operating expenses of the Los Angeles Railway are nearly 74 per cent of the transportation income. This ratio of expenses to earnings, he showed from records of the State Railroad Commission, is higher than in all but two or three other cities of the country.

"Roughly," said Mr. Lewis, "it costs us 3½ cents to handle each passenger. The reason for this is made evident in a report of the State Railroad Commission showing that, among the nineteen larger cities of the country, Los Angeles ranks first in number of miles of track per 10,000 persons.

"Of course," he continued, "some advantage will result from this undue proportion of track to the population when the density of traffic develops through the settling up of the city. But at the present time the only way open to us to cut expenses is to take cars out of service and also cut down the operating force. But the management of this road has never, and, unless forced to do so by the inroads of automobile competitors, does not intend to curtail service."

A striking set of figures that Mr. Lewis read, showed the manner in which the laying of new track here has kept pace with the city's growth. In 1890 there were fifty miles of track and 50,000 inhabitants; in 1899, 100 miles of track and 100,000 inhabitants, and at the present time, 370 miles of track and over 400,000 persons within the municipal limits.

Regarding the "jitney" bus, Mr. Lewis asserted that eventually, if allowed to run uncontrolled, they will necessarily operate to reduce the standard of the street-car service and that this will mean depreciated real estate values and a slackened outlay in both improvements and wages by the Los Angeles Railway.

At the conclusion of the talk Mr. Lewis showed a number of slides portraying the development of the system, numerous statistical diagrams and some overcrowded "jitney" busses.

OPPOSITION TO RULINGS ON OVERHEAD LINE CONSTRUCTION.

Power and light men in all parts of Idaho are greatly exercised over the proposed rules to be adopted by the public utilities commission to govern all overhead line construction by power, light, telephone, telegraph and railroad companies. On December 4th and 5th there was a meeting in Boise of the executive committee of the Idaho Power & Light Association, together with engineers of a number of the larger companies, lawyers, and others, especially interested. The matter under discussion was the nature of the proposed rules.

It will be remembered that in July last there was a hearing before the public utilities commission on this matter. At that time the different interests involved failed to agree. The power and light men insisted that the rules proposed by the telephone companies, especially, were so drastic in many of their provisions that they would raise the cost of construction for transmission and distribution lines to such a point as to make it practically impossible for the power and light companies to get out into the rural communities, and that they would drive the power and light companies off the streets and highways in many places and compel them to purchase private right of way at enormous cost in some cases. Because the representatives of the different interests failed to agree, the public utilities commission postponed action in the matter until January 11th.

The power and light men feel that the situation is a critical one for them. They insist that if the rules proposed by the telephone and railway companies are adopted and made the law of the state by the public utilities commission, that their industry will be crippled in several important particulars; that because of the greatly increased cost of line construction and other arbitrary provisions they will be barred entirely from many rural and remote communities, and to that extent the development of the entire state will be retarded.

The power and light men wish to be placed on record as favorable to rules of such character as will provide for construction safe to employes and the public. Such rules will permit these companies to go ahead with their development and extension work and bring into active production much of the territory that is now lying dormant.

Special interest attached to the meeting because of the presence of J. C. Martin, chairman of the overhead line committee of the Northwest Electric Light & Power Association, and John B. Fisken of Spokane, superintendent of light and power for the Washington Water Power Company. This company is the largest electrical company in northern Idaho and supplies power to the Coeur d'Alene mining district. Mr. Fisken is a member of the overhead line committee of the Northwest Electric Light & Power Association, and also a member of the executive committee of the Idaho Power & Light Men's Association.

When seen after the meeting Mr. Martin said he attended because of the deep concern the power and light interests of other states are taking in the action of Idaho.

"The Northwest Electric Light & Power Association, with which I am connected," he said, "extends over Montana, Idaho, Washington and Oregon. The matter of overhead line construction is of vital interest in all young states, especially where there is so much development depending on electric power, and where the cost of transmission and distribution lines is such an important factor.

"We realize, as everybody else does, that safety to human life is the first and most important consideration in

all these matters. We feel that the safety of employes and the public should be thoroughly protected, and still the rules for line construction be made so liberal that the electric power of the great northwest can be utilized in the development of the resources of the country."

Mr. Fisken also spoke of the importance of the coming action of the public utilities commission.

"My company," he said "in common with all other power companies operating in north Idaho, is vitally interested in the final outcome of this hearing now on with the public utilities commission. Few people in south Idaho realize what electric power means in the development of the mining industry. This is not only important to the large properties that are operating on a broad scale, that are producing mines, but infinitely more so to prospects, or new mines that still have their way to make in the world.

"To reach many of these prospects it is often necessary to construct long transmission lines. This is expensive, and many good mining prospects must be abandoned on this account. To add largely to the cost of construction of these transmission lines, and to establish rules that would make it practically impossible to build lines through many of the narrow canyons of the north would, in my judgment be disastrous to the mining industry.

"Power men are asking nothing unreasonable. We are not opposed to rules—we court the establishment of rules and are ready to co-operate with the commission and with all other interests to the end that our employes and the public shall have every possible protection. All we ask is that fair treatment be accorded this great industry and that the power and light men be accorded every reasonable facility in assisting in developing the state."

W. T. Wallace of Twin Falls, receiver for the Great Shoshone & Twin Falls Water Power Company, was another important power man in attendance at the conference from out of town. Speaking of the matter under consideration, Mr. Wallace said:

"My company serves what many consider the most important farming community in Idaho. We have many lines now extending into rural communities, and many farmers are availing themselves of electric power, not only for light and heat, but for much of the hard farm work. Naturally the rules to be adopted by the public utilities commission for line construction is of deep interest to us because we see in the development of farming in our section the great outlet for our surplus power. It would be especially unfortunate if the rules established were of such character as to make it impractical to extend transmission and distribution lines into all rural districts where power is demanded."

THE 1915 N. E. L. A. CONVENTION.

Plans are rapidly being perfected for the reception and entertainment of the thousands of delegates who are expected to attend the annual convention of the National Electric Light Association to be held at San Francisco June 7-11, 1915. As the great Exposition will make San Francisco the Mecca of the world next year reservations have already been made in the leading hotels and arrangements are beng completed to give the visitors a most royal welcome. The general convention committee, under the active leadership of Mr. John A. Britton, has been holding bi-weekly meetings since last August. Eight sub-committees have been working under the direction of a member of the general committee as chairman of each.

The guests are expected to arrive on special trains from each of the large cities throughout the country. The trains will be met by members of the committee and the delegates will be escorted to their rooms, where their every need will be anticipated. A series of luncheons, dinners and automobile parties will occupy every moment not devoted to the serious business of the convention.

The business meetings will be held in the great Auditorium in the new Civic Center. The large hall has been reserved for the week, together with smaller rooms seating a hundred or more for committee meetings.

Particular attention is to be paid to the ladies in the party, the large committee having laid out a round of amusements which will engage their attention throughout the week.

It is hoped that a large number of the Eastern visitors will arrange to spend some time in the West after the convention is over. The great hydroelectric systems with their tremendous transmission lines will be open for inspection, with every facility and comfort provided by the entertainment committee. Each of the power companies extend a most cordial invitation to visit their plants. The scenic wonders and climatic advantages of the West are at their best in June. The great Panama-Pacific International Exposition will be open and every visitor will be welcome.

An early registration with the New York office of the Association is desirable, as a beautiful guide book to San Francisco and surroundings will be immediately mailed to each delegate. A magnificent brochure illustrating and describing the great power plants of the West will also be distributed at the convention. Poster stamps, to the number of 100,000, will be supplied early in January to all who will distribute them where they will do the most good.

The lecture bureau of the Association has been provided with a complete set of lantern slides of the Exposition and will give an illustrated lecture to such of the company sections as desire to avail themselves of this opportunity.

Many other details, too numerous to list at this time, have been foreseen by the several committees. The complete list of Pacific Coast men who have been perfecting these matters is as follows:

SUB-COMMITTEES.

Entertainment.

W. W. Briggs, Chairman, 14 Sansome St., San Francisco.
S. V. Walton, Vice-Chairman, 445 Sutter St., San Francisco.
J. A. Vandegrift, Secretary, Oakland Lamp Works, 1048 16th St., Oakland.
Ralph L. Phelps, care A. Schilling & Co., 2nd and Folsom Sts, San Francisco.
R. F. Behan, Westinghouse Elec. & Mfg. Co., 165 2nd St., San Francisco.
F. W. Webster, Allis-Chalmers Co., Rialto Bldg., San Francisco.
Charles Murphy, United Light and Power Co., 511 Sutter St., San Francisco.
Thos. Finnigan, Pierson, Roeding Co., Rialto Bldg., San Francisco.
R .D. Holabird, Holabird-Reynolds Co., 523 Mission St., San Francisco.
Arthur Gunn, Wenatchee, Washington.
E. G. Robinson, Arlington, Washington.
J. E. Davidson, Portland, Oregon.
Joseph Thompson, Pacific Elec. & Mfg. Co., 80 Tehama St., San Francisco.
H . H. Cudmore, Rialto Bldg., San Francisco.

Finance.

George C. Holberton, Chairman, 445 Sutter St., San Francisco.
T. E. Collins, 2nd and Natoma Sts., San Francisco.
H. V. Carter, 575 Mission St., San Francisco.

Hotel and Local Transport.

F. H. Varney, Chairman, 445 Sutter St., San Francisco.
Wm. L. Goodwin, Pacific States Electric Co., San Francisco.
E. O. Shreve, General Electric Co., San Francisco.
F. W. Gay, J. G. White & Co., San Francisco.
Geo. Bragg, 445 Sutter St., San Francisco.
H. V. Gates, Hillsboro, Oregon.
A. C. McMicken, Portland, Oregon.
F. D. Weber, Portland, Oregon.

Ladies' Auxiliary.

T. E. Bibbins, Chairman, Rialto Bldg., San Francisco.
R. H. Ballard, Secretary, Southern California Edison Co., Los Angeles.
N. W. Brockett, Puget Sound Light and Power Company, Seattle, Wash.
C. S. McCalla, Washington Water Power Co., Spokane, Wash.
W. E. Coman, Manager Northwestern Electric Co., Portland, Oregon.
Harry Woodward, Great Western Power Co., Oakland.
Harmon Fischer, University of California, Berkeley, Cal.
R. J. Davis, Van Emon Elevator Co., San Francisco.
Chas. Wilson, 445 Sutter St., San Francisco.
Jos. S. Thompson, 80 Tehama St., San Francisco.
A. V. Thompson, General Electric Co., San Francisco.
H. A. Russell, General Electric Co., San Francisco.
J. C. De Remer, United Light and Power Co., San Francisco.

Local Registration.

W. F. Neiman, Chairman, 347 Grant Ave., San Francisco.
C. J. Wilson, 445 Sutter St., San Francisco.
A. G. Jones, General Electric Co., San Francisco.
C. H. Tallant, General Electric Co., San Francisco.
J. H. McDougal, 445 Sutter St., San Francisco.
L. M. Hardie, City Electric Co., San Francisco.
E. R. Northmore, Los Angeles Gas and Electric Co., Los Angeles.
H. H. Jones, San Diego Cons. Gas and Electric Co., San Diego.

O. B. Coldwell, Portland Railway, Light and Power Co., Portland, Oregon.
M. C. Osborne, Washington Water Power Co., Spokane, Wash.
Ed Quinn, San Joaquin Light and Power Co., Fresno, Cal.
W. J. Grambs, The Seattle Electric Co., Seattle, Wash.
George Campbell, Truckee River General Electric Co., Reno, Nev.
Fred Hamilton, Mt. Whitney Power Co., Visalia, Cal.
Samuel Kahn, Western States Gas and Electric Co., Stockton, Cal.

Meetings.

S. J. Lisberger, Chairman, 445 Sutter St., San Francisco.
R. J. Cantrell, 445 Sutter St., San Francisco.
T. C. Martin, 29 West 39th St., New York, N. Y.

Information Bureau.

Carl Heise, Chairman, 2nd and Natoma Sts., San Francisco.
R. M. Alvord, General Electric Co., San Francisco.

Press and Publicity.

A. H. Halloran, Chairman, Crossley Bldg., San Francisco.
F. S. Myrtle, 445 Sutter St., San Francisco.
H. H. Cudmore, Rialto Bldg., San Francisco.
C. F. Pierson, Southern California Edison Co., Los Angeles.
E. A. West, Portland Railway, Light and Power Co., Portland, Oregon.
J. E. McDonald, Secretary Joint Pole Commission, Pac. Elec. Bldg., L. A.
J. W. Redpath, Crossley Bldg., San Francisco.

NEWS OF OREGON RAILROAD COMMISSION.

The commission has set the following cases for hearing:

December 10, 1:30 p. m., Hood River. U-F-82, Sam G' Campbell, E. T. Hull, V. Winchell et al vs. Hood River Gas & Electric Company & Hydroelectric Company. (U-F-115, Application Hood River Gas & Electric Company to increase rates. U-F-116, Application Hydroelectric Company to increase rates.)

December 14, 10:00 a. m., Hubbard. U-F-114. Hubbard Creamery Company, S. W. Weaver and R. C. Painter vs. Molalla Electric Company, service and rates.

NEWS OF ARIZONA CORPORATION COMMISSION.

The commission has allowed the Mountain States Telephone & Telegraph Company to discontinue its exchange at Miami, Arizona, as patrons are to be served by a direct trunk line from Globe. The company has also been authorized to sell its grounded iron wire circuit between Camp Veide and Thompson's Ranch.

The hearing in the matter of the investigation of headlights to be equipped upon all locomotives operating upon railroads in Arizona has been continued until December 14, 1914.

The International Gas Company has been authorized to sell $100,000 in 8 per cent preferred stock and $200,000 in 20 year six per cent bonds, to furnish funds for supplying gas service in the town of Nogales.

NEWS OF IDAHO PUBLIC SERVICE COMMISSION.

Three orders were issued December 7th by the public utilities commission. Two of these related to the complaint of the Marsh Mining Company against the Washington Water Power Company. The other denies the application of the Pacific Telephone & Telegraph Company to place in effect a new schedule of rates between all points in the counties of Latah, Lewis, Nez Perce and Idaho. This application was filed November 11th. The commission finds that the effect of the schedule would be to increase many of the rates now in effect.

In the application of the Marsh Mining Company for a rehearing upon its complaint against the Washington Water Power Company, the commission has granted a hearing to be held on January 6th. Upon the representation of the mining company that it has been threatened with the removal of power wires and the discontinuance of power service by the Washington Water Power Company, the commission has made an order enjoining the power company from cutting off the power from the mining company's works, but has demanded of the mining company an undertaking conditioned for the payment to the power company of all claims in dispute or which may rise between this time and the outcome of the hearing.

During the first 11 months of the life of the commission, that part of the time for which the accounts have been made up, the total cost to the state was $37,350.65. This amount also includes the expenses of the tax commission, which is composed of the same members as the public utilities commission, occupied the same offices and the members of which serve without salaries for this particular work. When the commissions were created the legislature appropriated $80,000 for their work during the biennium. Therefore the work for the first period cost something more than one-third of the total amount at its disposal. The expenditures of the utilities commission used $26,586.99 and the remainder, $10,763.66, went toward the operations of the tax commission. Two hundred and twenty-six cases were handled by the public utilities commission during that period. Many of these were minor affairs, such as overcharges on freight or discriminations as a result of unjust rates. Further than this, the commission brought or took part in two cases, before the Interstate Commerce Commission. These were the coal rate case and the log rate case, which are now pending.

Among the more important cases which have been acted upon by the utilities commission are the power cases in the southeastern part of the state where, as a result of the influence of the commission, the rates have been lowered 35 per cent. Another case is the Hill City branch rate matter, where charges were made more equal in comparison with parallel lines. It is estimated by Mr. Miller, accountant for the commission, that the people of southeastern Idaho have been saved $20,000 by the reduction in rates made by the Great Shoshone Power Company, $15,000 by the Southern Idaho Power Company changes and $7884 by the difference which the commission's rulings have made per year in the cost of water to the people of Pocatello.

As to the work of the tax commission, it is estimated that a total of $75,000 or an excess of that has been added to the revenue of the various taxing districts over the state by additional property placed on the tax list through a scientific and systematic appraisement of the corporate property of the state and by the discovery of taxable property that had never been assessed at all.

It is estimated over the state that there was a total of $3,000,000 placed on the tax rolls through the efforts of the tax commission. In Idaho county alone the addition is said to be more than $750,000. Much was added to the tax rolls through the enforcement of the law relating to the collection of the personal property tax. Collections last year in this item alone are estimated to have increased $150,000.

Another work for which the tax commission claims credit is the preparation of statistical data at the request of Governor Haines showing the source of all revenue and a classified statement of the expenditures of all political subdivisions of the state, as well as all departments of the state government. It is generally conceded that this report has done much in the way of keeping down expenditures and reducing taxes.

As a result of the appointment of John W. Graham as a member of the public utilities commission there may be some change in the policies of that body. Mr. Graham has some ideas of his own along the line of work that the commission deals with.

Regarding his attitude toward monopolies, Mr. Graham said that he was neither for nor against them, speaking generally. "Each individual case," he said, "brings its own problems. In many cases, in a state such as Idaho, the existence of a monopoly means that many sources of power will remain undeveloped and here we have almost unlimited use for electric power, it seems."

"For instance," he continued, "along the Snake River, there are power sites which, if developed, would produce energy in abundance and it seems to me to be unfortunate that they are wasted. I imagine there are other parts of the state where this same condition exists."

Schedules of rates to be charged for electric light, heat and power service have been filed with the public utilities commission by the Swan Creek Electric Company of St. Charles. These rates are for the town of Fish Haven, Idaho. only. For lighting and general household purposes the charge will be 10c per kilowatt hour. The flat rate will be two 16 candle power lights for $1.00 a month. Power charges by this company will be 6c a month for the first 500 kilowatt hours consumption, for the next 9400 kilowatt hours 3 cents, and for any additional consumption 2 cents per kilowatt hour. The schedule will become effective January 1st. The company applied at one time for a certificate of public necessity to operate in St. Charles, but the commission found that the Utah Power & Light Company was serving that territory and refused the application.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The commission has rendered a decision authorizing the Coast Valleys Gas & Electric Company to issue $100,000 of its first mortgage 6 per cent 40 year bonds at not less than 90. The company proposes to use the sum of $69,392.43 to extinguish notes payable and certain accounts payable and to apply the balance upon additions and betterments.

The Escondido Utilities Company, operating a gas and electric plant in the city of Escondido, San Diego county, has filed an application with the commission requesting authority to borrow a sum of money not exceeding $30,000 and to execute its promissory note therefore. The company proposes to secure the payment of this note by the pledge of 45 of its bonds issued under deed of trust dated December 28, 1909, to the Los Angeles Trust & Savings Bank.

The commission has issued a supplemental order authorizing the Alta District Gas Company to acquire the system operated by A. A. Weber in the city of Dinuba. The company is also authorized to issue $28,000 par value of capital stock to be given to Mr. Weber in exchange for his plant. The company is also authorized to execute a promissory note in the principal sum of $10,000 payable three years after date and bearing interest at the rate of 8 per cent per annum.

The Roseville Telephone Company of Roseville, Placer county, has filed an application with the commission requesting authority to issue $4,000 of stock to provide for additions and betterments during the coming year.

The San Joaquin Light & Power Corporation has filed an application with the commission requesting authority to renew promissory notes totaling $92,500.

The Midland Counties Public Service Corporation has filed an application with the commission requesting authority to renew promissory notes totaling $24,795.77.

The commission has rendered a decision authorizing the San Francisco-Oakland Terminal Railways to renew two promissory notes in the sum of $5,890.92. These notes will bear interest at 6 per cent per annum and will be payable 90 days after date to the Railway Improvement Company.

The Western States Gas & Electric Company has filed an application with the commission requesting authority to issue $101,000 par value of its 5 per cent bonds at not less than 82½ and accrued interest. The company proposes to use the proceeds from the sale of these bonds in reimbursing itself for expenditures made for additions and betterments to its plant.

The commission has rendered a decision authorizing the Fresno Interurban Railway Company to issue 100 shares of its capital stock of the par value of $100 per share at a price not less than 80. These shares are to be issued in lieu of 100 shares of the company's stock purported to have been issued for the purpose of incorporation at the price of $10 per share. The proceeds from the sale of this stock are to be used by the company for the purchase of equipment in the sum of $4,700 and for the payment of engineering, administration, legal and other contingent fees.

The commission has rendered a decision authorizing the Western States Gas & Electric Company to renew promissory notes totaling $45,000 now held by H. M. Byllesby & Company.

The commission has rendered a decision granting a certificate of public convenience and necessity authorizing the Marin County Electric Railways to operate in the town of Sausalito, Marin county, on the condition that the present franchise shall be amended so as to allow the municipality the right to purchase the system after a period of five years. The company is also granted authority to issue 185½ shares of capital stock at par.

The Nevada-California Power Company, operating in Inyo county, California, and Esmeralda and Nye counties, Nevada, has filed an application with the commission requesting authority to execute an "open end" mortgage securing an issue of first and refunding 6 per cent 50 year gold bonds. The company proposes to use the proceeds from this bond issue in refunding bonds outstanding amounting to $2,663,000; constructing a new power plant on Bishop Creek, and for other necessary additions and betterments.

The Southern Sierras Power Company, operating in the counties of Inyo, Kern, Santa Barbara, Riverside and Imperial, has filed an application with the commission requesting authority to execute an "open end" mortgage of its properties for the purpose of securing a first and refunding 6 per cent 50 year gold bond issue. The company proposes to use the proceeds for the purpose of refunding its outstanding obligations, for betterments and additions, for refunding its present outstanding bond issue and for the purpose of providing for future requirements.

The Plumas Light & Power Company operating in Plumas county, has filed an application with the commission requesting authority to create a bonded indebtedness in the sum of $100,000 to be represented by 100 20 year 6 per cent bonds. At the present time, the company wishes authority to issue at not less than 80 $52,000 par value of such bonds.

The commission has issued an order extending to January 1, 1916, the time within which the United Fuel & Power Company may issue $197,000 of stock previously authorized by the commission.

The commission has rendered a decision authorizing the Fresno Interurban Railway Company to issue 2125 shares of common stock of the par value of $100 per share, $350,000 of its first mortgage 6 per cent 25 year bonds and $350,000 of its 6 per cent cumulative preferred stock.

The commission has rendered a decision, holding in abeyance for the present its final order on the application of the Marin County Electric Railways for authority to begin construction work in Mill Valley on private funds pending the further sale of stock and receipt of deferred payments on stock already subscribed.

The commission has rendered a decision authorizing the Oakland, Antioch & Eastern Railway to issue promissory notes of the total face value of $295,345.28. It is made a condition of the commission's order that these notes shall bear interest at not to exceed 7 per cent per annum.

NEW CATALOGUES.

Bulletin No. 32 from Wilton Manufactuing Company, Wrightsville, Pa., illustrates and describes the Wico "Hangstrait" Hickey, an adjustable malleable iron ball and socket joint hickey giving correct alignment to electric fixtures.

Bulletin No. 106 from the Wagner Electric Manufacturing Company illustrates and describes the use of single-phase motors from the central station standpoint. Facts and figures are given of the low installation cost, the high starting torque and the low starting current and good power factor of Wagner single-phase motors.

CALIFORNIA ASSOCIATION OF ELECTRICAL INSPECTORS

Section of N. A. E. I.

C. W. Mitchell, President. Arthur Kempston.
Wm. G. Pennycook, Vice-Pres. B. C. Hill, Executive Comm.
John W. Carrell, Secretary-Treasurer, 814 Scott, San Francisco.

The purpose of this organization is to standardize the common practice in electrical construction with the National Code as the general standard.

Questions pertaining to electrical construction will be answered in these columns, but only from the point of view of the Code. This is a voluntary organization and the answers published under this heading must not be construed as authoritative, or binding. No attempt will be made to correllate the answer from the several Inspection Districts, as an occasional difference of opinion will tend to induce further study on subjects. All questions will be passed upon by an executive committee.

Address all communications to the secretary.

By the Secretary.

Requests received for information concerning protection of buildings from lightning indicate considerable interest on the subject.

When water evaporates each diminutive particle of vapor possesses a minute charge of static electricity distributed over its surface. When vapor forms a cloud the charge that was possessed by each particle is distributed over the surface of the cloud. Because the surface of the cloud is an inconceivable number of times smaller than the combined surfaces of the particles which form it, the difference of potential between earth and cloud is eventually great enough to break down the stratum of air between. Tops of structures are of course nearer the clouds than is the earth and when the path of least resistance is through a building damage usually occurs, ranging from freakish pranks to the causing of disastrous fires.

The following notes are taken from "Suggestions for Protection Against Lightning" compiled and published by National Fire Protection Association.

The idea of protection is a metallic cage with the bars, of course, considerably separated, with air terminal projections at the high points of the structure and the whole protecting cage thoroughly grounded. Protection is advisable on isolated buildings and on all buildings, however located, having elevated features. The amount of protection depends upon location, construction, occupancy, value as compared with protection expense, and frequency and severity of electrical storms. In general all metal buildings, metal chimneys or stacks need only be grounded.

Conductors of heavy copper or galvanized pipe, or equivalent, are used to connect the protecting cage to the earth. The grounds are underground water-pipe systems, ground plates or driven pipes, with preference given in order named.

Exterior metal work, such as cornice work, etc., is bonded to the conductors below the line of the metal work.

Interior metal work such as structural steel, beams, etc., (but not gas pipes) are bonded to the system at their highest and lowest points. Gas pipes are to be kept away from system as far as practicable but to have bonds placed around meter.

Tall structures such as chimneys or steeples are protected by means of two or more rods extending from the top to the ground and having metal bands around the structure at intervals, each band connected to the vertical rods.

TRADE NOTES.

The Holt Manufacturing Company will rebuild its Spokane warehouse, recently destroyed by fire, at a cost of approximately $20,000.

W. H. Martens has decided to build and operate a small glass factory at Spokane. Local materials are said to be plentiful, including silica sand and high grade fire clay.

Pacific Coast representatives of the Edison Storage Battery Company have received telegrams that the fire damage to the plant at East Orange, N. J., was not as serious as first reported. The phonograph works were burned, but the output of other Edison products will not be affected.

The Empire Manufacturing Company of Spokane, Washington, and the Pendleton Iron Works of Pendleton, Oregon, will unite their plants and operate same at Pendleton. A rotary pump, iceless refrigerator, split wood pulley and other patented articles will be manufactured. The consolidated plant will be capitalized at $125,000 and will employ 25 men.

On December 10th, the Power Equipment Company of San Francisco was awarded a contract for the complete installation of a large pumping plant, which is to be used on the Blevins, Mallon, Rice project. Four 24 in. centrifugal pumps, of the Worthington type will be furnished, direct connected to motors of the Westinghouse type. The contract will be completed in time for service in March. Charles De St. Maurice is engineer in charge of this project.

The newspaper reports of the Robbins and Myers fire at Springfield, Ohio, are misleading. The electrical plant was not damaged and there will be no interference in filling orders for motors, generators and fans. Arrangements have been made with adjoining manufacturers for use of their foundries and the only delay will be in transferring patterns from the Robbins & Myers plant to these foundries. Construction of a new modern foundry plant has been started. The loss was entirely covered by insurance.

In order to serve the electrical demands of the Panama-California Exposition, the San Diego Consolidated Gas & Electric Company is installing a new 4000 kilowatt steam turbine unit under the supervision of the Engineering Department of H. M. Byllesby & Company. There is also being installed three additional transformers of 1000 kilowatt capacity each. The new unit will be ready for service December 15th, although the fair does not open until New Year's eve. The hour of opening means that electricity will play a very important part in the event and the electric company is taking every precaution to have everythng in readiness for perfect service. The electrical requirements of the exposition, including both power and lighting, will total about 2500 kilowatts, or more than 3000 horsepower.

SAN FRANCISCO ELECTRIC DEVELOPMENT AND JOVIAN LEAGUE.

This week's gathering was the semi-annual meeting. Many important subjects and far-reaching plans on the future operation of the League's work and upon the opening of the League after the Christmas holiday season will be taken up and actively pursued.

After the routine business was disposed of President Carl Heise, in an eloquent and earnest address, told the meeting what had been done in an effort to broaden the scope of the League's efforts; the results of the visit of Mr. Muldaur of the Society of Electrical Development of New York, while in San Francisco and the hope for still greater cooperation and closer working arrangements with the central stations. Mr. E. M. Cutting told in detail of the accomplishments of Electrical Leagues of other cities and some things which might be done by the local organization.

The new officers elected were: President, F. H. Leggett, manager Western Electric Co.; Vice-President, C. F. Butte of the Butte Engineering Co.; Secretary-Treasurer, E. B. Strong; members of the Executive Committee, Mr. C. C. Hillis, manager Electric Appliance Co.; Mr. Geo. Holberton, district manager Pacific Gas & Electric Co.

Some 50 members were present and in all the meeting was one of the most enthusiastic held during the year.

NEWS NOTES

INCORPORATIONS.

MEDICAL LAKE WASH.—The Mallory Prairie Telephone & Telegraph Company has been incorporated here.

LOS ANGELES, CAL.—Kanaky Electric & Manufacturing Company has been incorporated with a capital stock of $25,000, subscribed $15,000, by S. E. Gear, E. E. Hull and H. P. Kanaky.

PASADENA, CAL.—Articles of incorporation have been filed for the Pasadena Electric Welding Company, with a capital stock of $250,000. The directors are Hugo Thornblade, W. A. Clench and S. E. McRae.

ILLUMINATION.

AUBURN, CAL.—Preliminary plans for a municipal lighting plant are under contemplation.

LONG BEACH, CAL.—The Long Beach Consolidated Gas Company is preparing to extend its system into the unincorporated territory known as Bay City.

LOS ANGELES, CAL.—The Southern California Edison Company has been awarded the contract for maintaining additional lights in Lankershim Lighting District.

SAN DIEGO, CAL.—Bids will be received up to December 28th for the installation of the Abbott Street Lighting No. 1, in accordance with specifications on file in the office of the city clerk.

LOS ANGELES, CAL.—An ordinance has been passed granting property owners permission to install a lighting system on Hollywood boulevard between Cherokee and Orchid avenues, under private contract.

PASADENA, CAL.—Electric lights are being sought by property owners of Linda Vista. Soon as the water question is settled it is likely that steps will be taken to obtain street illumination for the recently annexed territory.

WINSLOW, ARIZ.—Manager E. H. Means, of the Winslow Gas Company, has completed arrangements for the erection of a gas plant on blocks 3 and 4 of the Campbell addition. Construction work will be started immediately.

LONG BEACH, CAL.—Bids are being taken by the board of public works for furnishing electric energy for heat, light and power in this city for one year, beginning January 1, 1915, in accordance with specifications on file in the office of the board.

ANAHEIM, CAL.—Ornamental lights will be installed in the business district early in the new year. The style of posts has been decided on and the contract for the construction will probably be awarded at the next meeting of the city trustees.

FULLERTON, CAL.—The Southern Counties Gas Company has petitioned the board of supervisors to offer for sale a franchise to lay gas mains over county roads reaching from La Habra to the ocean. This strip included Buena Park, Cypress, Seal Beach and Sunset Beach. The franchise will be offered for sale December 22.

TACOMA WASH.—An ordinance has been passed by the city council providing for the improvement of C street et al by installing a system of lighting consisting of metal standards with a single globe lamp on each, the necessary wires, cables, conduits, etc., to be according to specifications of the city engineer. The estimated cost is $17,241.

MONTESANO, WASH.—L. H. Burnett and associates closed a deal for one acre of land on the river front of Montesano on which the new gas plant will be erected. Mr. Burnett states that his company will be ready to sell gas by March 1st. Two car loads of gas pipe are on their way here and the work of laying pipe will commence immediately.

LOS ANGELES, CAL.—In accordance with an ordinance passed by the city council declaring its intention to order the necessary appliances to be installed and electricity to be furnished for one year for lighting of Figueroa street between Sixth and Tenth streets, for the lighting of Grand avenue, between Sixth and Ninth streeth, for lighting of Main street from Pico street to Thirty-sixth place, January 6th has been designated as the time for hearing all protests in regard to such improvements.

GOLDFIELD, NEV.—City lighting for Gold Hill was the topic of much spirited debate at the last council meeting when the city board of councilmen met with the committee on lighting and the representatives of competing companies. Represented by C. W. Martin, the California-Oregon Power Company made a bid for the city lighting on a ten year contract, specifying eighteen three-cluster lights of the type now in service at the News corner, thirty-five single lights on neat wooden standards, sixteen lights on iron standards, and one large cluster of three lights at the bridge, to be completely installed and maintained at a cost of $55 per month the system to be in operation within thirty days. F. W. Dodge, engineer of the Rogue River Public Service Corporation, which is now developing an extensive power project at the city limits, agreed to duplicate the rival company's bid of specifications, constructing an entire new pole line throughout the city, at a cost to the city of $50 per month for service. On behalf of his company Mr. Dodge further offered to furnish a surety bond to the city in the amount of $5000 for the construction of the system and its satisfactory operation within 60 days, explaining that the additional delay would be necessary to permit the completion of work upon the dam now building. After a heated discussion the council decided with one dissenting vote to award the contract to the California-Oregon Company.

TRANSMISSION.

WEAVERVILLE, CAL.—The supervisors of Trinity County have advertised for bids for a franchise as applied for by the California-Oregon Power Company to operate within the county.

SEATTLE, WASH.—The Puget Sound Traction Light & Power Company is constructing a power transmission line from its White River station to the plant of the Carbon Hill Coal Company at Carbonado, Wash.

SEATTLE, WASH.—The Northwest Development Company is making ready to invade the Coeur d'Alene mining district in Idaho with electric power competition. Transmission lines are now being constructed into this region by the new company.

JUNEAU, ALASKA.—The Alaska Electric Light & Power Company, Juneau, Alaska, has practically completed its extensive development program and has expended something like $75,000. The plant has a capacity of 1500 kilowatts with its steam and water power combined.

LONG BEACH CAL.—An ordinance providing that all electric wires be placed underground was taken from the table at a recent meeting of the city council and adopted on third reading with minor amendments, which stipulate that work shall begin on the proposed improvement not later than July 1st, next year, and be completed before the end of 1915.

SAN DIEGO, CAL.—The county board of supervisors has under consideration a petition for a franchise for electric

light, power and transmission lines from Escondido through Rincon, San Marcus and San Pasqual valleys. It is proposed by the Escondido Mutual Water Company to build an electric transmission line from its power plant on San Luis Rey River to the power plant below the reservoir, thence to Escondido.

LOS ANGELES, CAL.—D. S. Parks has filed with the board of public works a condensed report of the aqueduct power project up to November 30th, which shows the work now under way totals $3,550,895. This includes the San Francisquito Canyon plant No. 1; waterway leading from Elizabeth tunnel to plant No. 1; waterway leading from plant No. 1 to aqueduct tunnel No. 73 and the cost of necessary equipment, such as pipe lines, etc.

SALT LAKE CITY, UTAH.—One of the most important steps taken by the Utah Light & Traction Company this year in furtherance of the civic beauty idea that has gained headway in this city was completed during this week when the engineering department of the company completed the work of "cutting over" from the overhead wires to the conduit cables, the current transferred from the main power supply station on the Jordan River to the West Temple plant, for operating the railway system and the commercial district lighting and power currents. This work has been in progress for several months, the conduit crew keeping just ahead of the paving contractors, who have had improvement work in that part of the city. As a result of cutting over this current the work of removing the forest of poles, carrying hundreds of wires, is now being carried on and will be completed within a few days. By reason of this improvement West Second South street is being made one of the finest business streets in the city, on a par with Main street, State street, Broadway and other thoroughfares in which the traction company has completed this work. The cost of this improvement in round figures is somewhat in excess of $30,000.

AMERICAN FORK, UTAH.—Recently Mayor Gurney and City Councilmen Wing and Evans filed on the power site located at the mouth of Deer Creek in American Fork Canyon. While the filing is in the names of the above named gentlemen, it is given out that it was done with the intention of holding it for the city. At the present time the city could not bond for enough money to install a plant and the necessary lines, etc., which would cost in the neighborhood of $100,000. It is probable that the next legislature will pass a law increasing the limit of the city's indebtedness for this purpose. The filing covers that made by C. W. Earl several years ago, and is considered to be one of the best undeveloped in the state. The petitioners ask for 17 second feet of water from American Fork Creek proper and 3 second feet from Deep Creek. They will be commingled together in a reservoir to be built on Silver Lake Flat, from which place the water will be released for water purposes as needed. The project will require a wooden stave pipe line 18,000 ft. long to get the canyon proper water into the reservoir, and another pipe line 6000 ft. long to get the Deer Creek water into the reservoir. The natural low water flow of the combined streams is 20 second feet, but this will be greatly increased by reservoiring the flood waters. The pipe line from the reservoir to the power house site is 7542 ft. long, the lower part of which will have to be most expensive steel pipe. The proposed plant will have a capacity of about 1500 horsepower. While the city has no present intention of building the plant, the officials thought that it would be good safe policy to file on the site, which was entirely agreeable to Mr. Earl, who has spent hundreds of dollars in filings, surveys and securing data. If the coming legislature grants the necessary increased bonding privilege and the citizens generally show a disposition for the city to own its own plant, then it is probable that the plant will be built.

TRANSPORTATION.

MILWAUKEE, ORE.—The council has granted a 25 year franchise to the Portland & Oregon City Railroad, Stephen Carver, to operate an interurban line through Milwaukee.

SEATTLE, WASH.—Corporation Counsel Bradford holds that it is legal for the city of Seattle to operate that part of the Lake Burien car line extending outside the city limits.

BOISE, IDAHO.—C. J. Franklin, a civil engineer of Boise, Idaho; J. G. Brown, finance commissioner of Galion, Ohio, and E. A. Pack of Weiser, Idaho, are considering the construction of an interurban road over the Blue Mountains from Boise to La Grande, Oregon, a distance of 75 miles.

SAN FRANCISCO, CAL.—M. M. O'Shaughnessy, city engineer, has been directed to prepare plans and specifications for the proposed line of the Municipal Railway through Golden Gate Park into the Sunset District. The supervisors have unanimously adopted a resolution to that effect. The line will be routed through the park from the present terminus of the road at Tenth avenue and Fulton street, running in back of the Museum and skirting Strawberry Hill near the Japanese tea garden. The cars will emerge at Fourteenth and run up to Kirkham street.

FALLON, NEV.—At a meeting of the stockholders of the Fallon Electric Railroad Company last week the following officers were elected: C. A. Hascall, president; H. A. Lattin, vice-president; E. S. Berney, general manager and treasurer, and A. E. Wilson, secretary. These officers, together with A. Baumann, constitute the board of directors. The company plans to push the work on their grade to Sand Springs and hopes to have it completed at an early date. About 12 miles of the grade have been completed. The Berney Construction Company has taken the contract to complete the grade to Sand Springs and to install all bridges and culverts.

BOISE, IDAHO.—Judgment for $195,129 was given E. H. Jennings of Pittsburg Tuesday, against the Idaho Railway, Light & Power Company and O. G. F. Markhus, receiver. This was tried some time in the spring and was taken under advisement by Judge McCarthy. Mr. Jennings, who is a Pittsburg capitalist was the first to subscribe $100,000, which enabled W. E. Pierce to take over the old Boise Railway Company and inaugurate the Boise Interurban Line. When Mr. Pierce sold out the Boise & Interurban to the Idaho Railway he received cash for his interest, but Mr. Jennings, according to Mr. Pierce, agreed to take his $180,000 interest in stock. This debt was never paid to Mr. Jennings in any way and the present judgment is to cover the amount, together with $11,000 in interest and attorney's fees.

OGDEN, UTAH.—The Salt Lake & Ogden Interurban Company has completed its road bed for the west track on Lincoln avenue, between Twenty-sixth to Thirtieth streets, and cars will be operated over it in a few days. This roadbed is laid with metallic ties and reinforced concrete. The east track in the same district will be made of the same material, but it is said that the work will be delayed until after the winter months. The avenue along this new roadbed was laid in concrete during the summer months. The company is also building double track from the south side of Twenty-fourth street, at the intersection of Lincoln avenue, to the "Interurban Terminal" in the center of the block, between Grant and Lincoln avenues and between Twenty-third and Twenty-fourth streets. A steam shovel is being used to excavate for the roadbed and a large concrete mixer is on the ground. Metallic ties are also being placed on this part of the road and 85 pound rails are being used. Double tracking on Lincoln at Twenty-fifth street has been extended over the intersection and it is said by officials of the company that the road will be double-tracked the entire distance between Twenty-fourth and Twenty-fifth, early in the spring of the year.

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B-3 Blake Signal and Manufacturing Co.....
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C-1 Century Electric Co..... 3
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C-2 Colonial Lamp Works.....
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C-3 Crocker-Wheeler Co.....
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C-5 Crouse, Hinds & Co.....
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C-4 Cutler-Hammer Manufacturing Co.....
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F-1 Fairbanks, Morse & Co.....
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F-2 Fort Wayne Electric Works of G. E. Co.....
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